MID-CURRITUCK BRIDGE STUDY

2040
TRAFFIC ALTERNATIVES REPORT

WBS ELEMENT: 34470.1.TA.1
STIP NO. R-2576
CURRITUCK COUNTY
DARE COUNTY

Prepared by
WSP USA

for the

North Carolina Turnpike Authority
North Carolina Department of Transportation

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1.0 Introduction

This 2040 Traffic Alternatives Report supports the Mid-Currituck Bridge Final Environmental Impact Statement (FEIS) reevaluation being conducted by the North Carolina Turnpike Authority (NCTA). The study is examining a new seven-mile bridge connecting US 158 near Aydlett to NC 12 south of Corolla on the Currituck County Outer Banks. The project study area includes US 158 between Barco and Southern Shores and follows NC 12 north from Southern Shores to Corolla as shown in Figure 1.

1.1 Project Background

The Mid-Currituck Bridge project, STIP R-2576, has been under study for several years dating back to before 1995. The most recent traffic analysis was prepared and summarized in the 2035 Traffic Alternatives Report dated April 2008 and revised March 2009. The 2035 Traffic Alternatives Report was utilized in the EIS process to evaluate congestion measures and design requirements for the proposed project. In 2012, a draft Record of Decision (ROD) was prepared based on the 2035 Report. Prior to final signature, however, the NC General Assembly rescinded state funding that was required for the project. At that time, a decision was made that the ROD would not be signed since there was inadequate funding to construct the project. In 2015, the Mid-Currituck Bridge project was included in NCDOT's 2016-2025 STIP for construction funding starting in 2017.

The study area traffic network serves highest traffic volumes in summer especially on summer Saturdays and summer weekends. For this project, the design period is the Summer Weekday. To test worst case operations from a systems perspective as well as to verify operations, a Summer Weekend traffic analysis is also included.

1.2 Chronology of Traffic Studies

This traffic report is a result of a series of traffic reports (dating back to 2002) originally included as part of a similar study conducted for the North Carolina Department of Transportation (NCDOT). The process has been an iterative process with revised alternatives, forecasts, measures of effectiveness, and issues that have been raised while completing the project. A chronology of various stages of traffic studies for the project is outlined below:

- *Traffic Needs Report (July 2002):* The initial traffic analysis for this phase of the EIS was completed and submitted to NCDOT as the Traffic Needs Analysis in July 2002. The report documented the methodology, assumptions, and findings for existing (2001) traffic conditions, future (2025) No-Build traffic conditions, and hurricane evacuation clearance times. The 2025 No-Build traffic conditions included analysis of thirteen

roadway links and two intersections. Hereinafter, the July 2002 main report will be referred to as the Traffic Needs Report (or TNR).

- *2025 Traffic Alternatives Report (May 2007):* Building upon the No-Build analysis, follow-up analysis was developed to look at 2025 traffic forecasts and traffic capacity under potential alternatives including widening and Build Bridge scenarios. This analysis step included traffic information for a new link, the Mid-Currituck Bridge. In addition, non-highway alternatives were investigated, including a sketch-level examination of reversible lanes. The findings were initially presented in a draft report in March 2004 to NCDOT, but were finalized and incorporated into the 2025 Traffic Alternatives Report (May 2007) submitted to the NCTA.

- *Revised 2025 Traffic Alternatives Report (December 2005):* Additional 2025 alternatives analysis was conducted to address issues identified in the first stage of the alternatives analysis. The first issue was to determine the year that traffic flow is expected to reach LOS E and LOS F under different roadway typical sections for the peak summer traffic seasons. The second issue was to examine the operational feasibility of a reversible third lane on NC 12 for use on summer weekends when tourists are arriving and departing beach houses as well as during a hurricane evacuation. The findings were initially presented in a draft report to NCDOT in December 2005, but were finalized and incorporated into the 2025 Traffic Alternatives Report.

- *2035 Traffic Alternatives Report (April 2008):* The 2035 Traffic Alternatives Report, developed in April 2008 and revised in March 2009, was an update of the 2025 Traffic Alternatives Report and utilizing year 2035 traffic volumes. In addition, the updated analysis examined the impact of expected toll diversion on traffic volumes. As with previous analyses, this analysis was built upon all previous alternatives analysis and draft reports. Although new assumptions were utilized in some cases, most of the analysis assumed that the previous traffic studies were applicable. The additional analysis focused on new information related to traffic operations.

1.3 Need for Updated Analysis

In 2015, the Mid-Currituck Bridge project was included in NCDOT's 2016-2025 STIP for construction funding starting in 2017. To proceed with the project, multiple elements needed to be reevaluated and the NEPA documentation needed completion. As part of this reevaluation process, it was determined that the traffic analysis needed to be updated, primarily to account for a general slowdown in development activity in Currituck and Dare Counties and reflected in the updated project level traffic forecast dated June 2016.

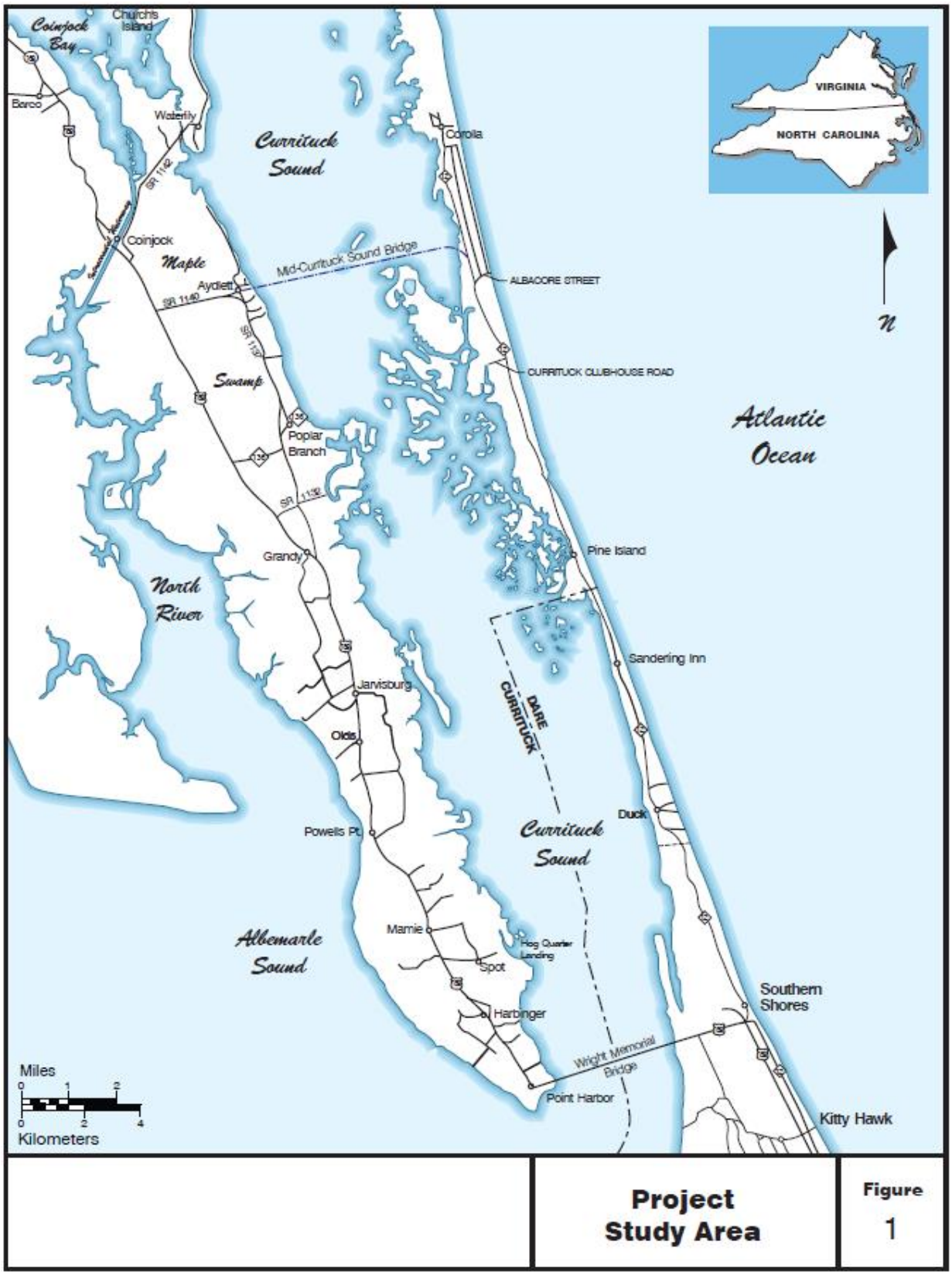

Figure 1. Study Area

As a result, the NCTA requested an update of the traffic analysis. The updated analysis is intended for two primary purposes:

- Update the project's assessment of the travel benefits of the project – included in this report,
- Evaluate the required geometric improvements needed to serve future traffic volumes – detailed analysis included in another report.

1.4 Alternatives Under Consideration

This report considers a No-Build alternative and two Build alternatives, ER2 and Preferred Alternative. The Build alternatives are shown in Figure 2 and Figure 3.

The No-Build alternative is evaluated for both 2015 Existing and 2040 Future conditions while the Build alternatives are evaluated for 2040 Future conditions only.

1.4.1 Existing Conditions – Base Year 2015

This is the Existing or No-Build network with 2015 traffic volumes.

1.4.2 No-Build Alternative – Future Year 2040

This is the No-Build network, identical to the 2015 Existing network with no improvements, with 2040 traffic forecasts.

TIP Project Number R-3419:

TIP Project Number R-3419 is included in the most recent NCDOT 2018-2027 TIP. It was added to the TIP close to the end of the completion of this analyses. R-3419, as stated in the TIP, included access improvements on US 158 from the Wright Memorial Bridge to US 64. The assumption included in this analyses is that this section of NC 158 would be a 4-lane superstreet. Analyses including R-3419 was done for all alternatives. The analyses also include the section of NC 158 east of NC 12 (Link 8). The results of the analyses are the italicized numbers in tables 14, 15, and 16.

TIP Project Number R-2574 is outside the study area for traffic modelling. However, the project is factored into the traffic volumes assumed at the NC 158 and NC 168 intersection used in the analysis

1.4.3 Existing Road Improvement Alternative (ER2) – Future Year 2040

The "ER" in ER2 stands for "Existing Roads". A Mid-Currituck Bridge is not included in this alternative, but only widening existing sections of US 158 and NC 12. ER2 was developed to achieve transportation benefits using existing roadways while minimizing impacts to communities along those roads. The basic features of ER2 are:

- Widening US 158 to a six-lane super-street between the Wright Memorial Bridge and the NC 12 intersection with US 158.

- Constructing a super-street T-intersection at the current intersection of US 158 and NC 12, with modified access pattern for the Aycock Brown Welcome Center (Visitor Center).

- Widening NC 12 to three lanes (two travel lanes and a center lane for left turns) between US158 and a point just south of Duck, at the existing three-lane section in Duck.

- Hurricane evacuation improvements on US 158 between NC 168 and the Wright Memorial Bridge, which would not affect normal daily congestion levels.

ER2 is shown in Figure 2. The components shown reflect the revised ER2 design prepared to take into consideration the 2040 traffic forecasts prepared in 2016.

1.4.4 Mid-Currituck Bridge Preferred Alternative – Future Year 2040

The Preferred Alternative includes construction of a Mid-Currituck Bridge, as well as limited improvements to existing NC 12 and US 158. The Preferred Alternative identifies the extent to which network congestion and travel time could be improved, as well as other associated benefits, if only a Mid-Currituck Bridge were built. Limited existing road improvements were added to MCB4 to ensure that southbound traffic on NC 12 from the bridge would not queue back onto the bridge on summer weekend. The basic features of this alternative are:

- Constructing a 5.3-mile-long, two-lane toll bridge across Currituck Sound, with approach roads, in Currituck County. The mainland approach road to the bridge over Currituck Sound would include a bridge over Maple Swamp.

- Improvement to NC 12 in the bridge terminus area, including a roundabout at the bridge's connection to NC 12.

- US 158 improvements would include an interchange at the connection of US 158 and the proposed bridge. Toll plazas would be just east of the interchange. Drivers traveling between US 158 and Aydlett would continue to use Aydlett Road.

- For hurricane evacuation improvement, traffic will use the existing center turn lane on US 158 from the interchange to the intersection of US 158 and NC 168 as a third outbound evacuation lane. One inbound lane on the Knapp (Intracoastal Waterway) Bridge would be used as a third outbound evacuation lane. In addition, adding approximately 1,600 feet of new third outbound lane to the west of the NC 12/US 158 intersection in Dare County to provide additional hurricane evacuation capacity.

The Preferred Alternative is shown in Figure 3. The components shown reflect the revised Preferred Alternative design prepared to take into consideration the 2040 traffic forecasts prepared in 2016.

1.5 Methodology

The focus of this analysis is to understand roadway network performance and along with transportation supply and trip-demand interactions for Mid-Currituck Bridge project alternatives from a planning perspective. A sketch-planning tool based on *generalized service volume table* approach was used for this analysis. This section provides an overview of methodology used in this planning level analysis.

The methodology is based on Chapter 6 of Highway Capacity Manual 2016 (HCM 2016). According to HCM [Page 6-1, Chapter 6/ HCM and Alternative Analysis Tools],

> *"Generalized service volume tables are sketch-planning tools that provide an estimate of the maximum volume a system element can carry at a given level of service (LOS), given a default set of assumptions about the system element. The use of local default values and local generalized service volume tables helps reduce the uncertainty in the results of analyses that use these tools, compared with using the HCM's national default values and tables."*

As in previous analysis, the network congestion review is a planning level review and not intended to be a detailed capacity/ simulation analysis of network congestion. As such, the use of this sketch planning methodology (i.e. lookup tables based on HCS methodology) is appropriate. In addition, it is consistent with the type of analysis conducted in the previous analysis.

In this study the system element is roadway corridor, as defined by 16 (+1) links in Figure 4. Table 1 provides details about the 16 (+1) links including cross-section assumed for analysis.

The generalized service volume table provides a Level of Service (LOS) threshold for each cross-section examined in this study. Demand to Capacity (D/C) and Volume to Capacity (V/C) ratios can be computed based on hourly link volumes and LOS thresholds. If the demand is higher than capacity (LOS F threshold), the hourly volume is constrained to capacity and the demand is spread to adjacent time period (peak hour spreading). For this study congestion is generally defined as LOS E or worse.

The following sections provide more details including assumptions and inputs:

- Daily and hourly forecast utilized are discussed in Chapter 2.0

- Level of service thresholds are detailed in Section 3.2

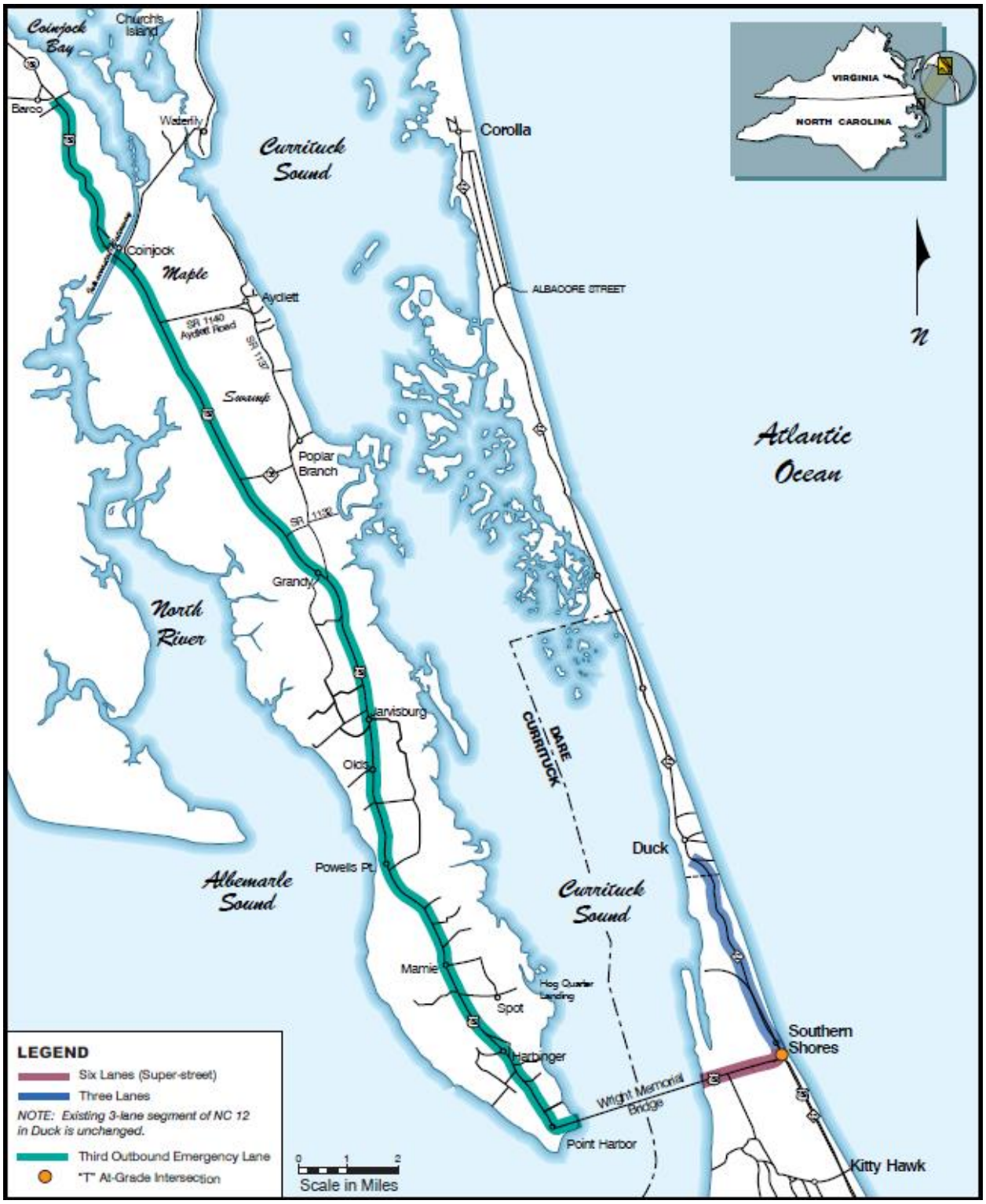

Figure 2. ER2 (Revised Design) Alternative

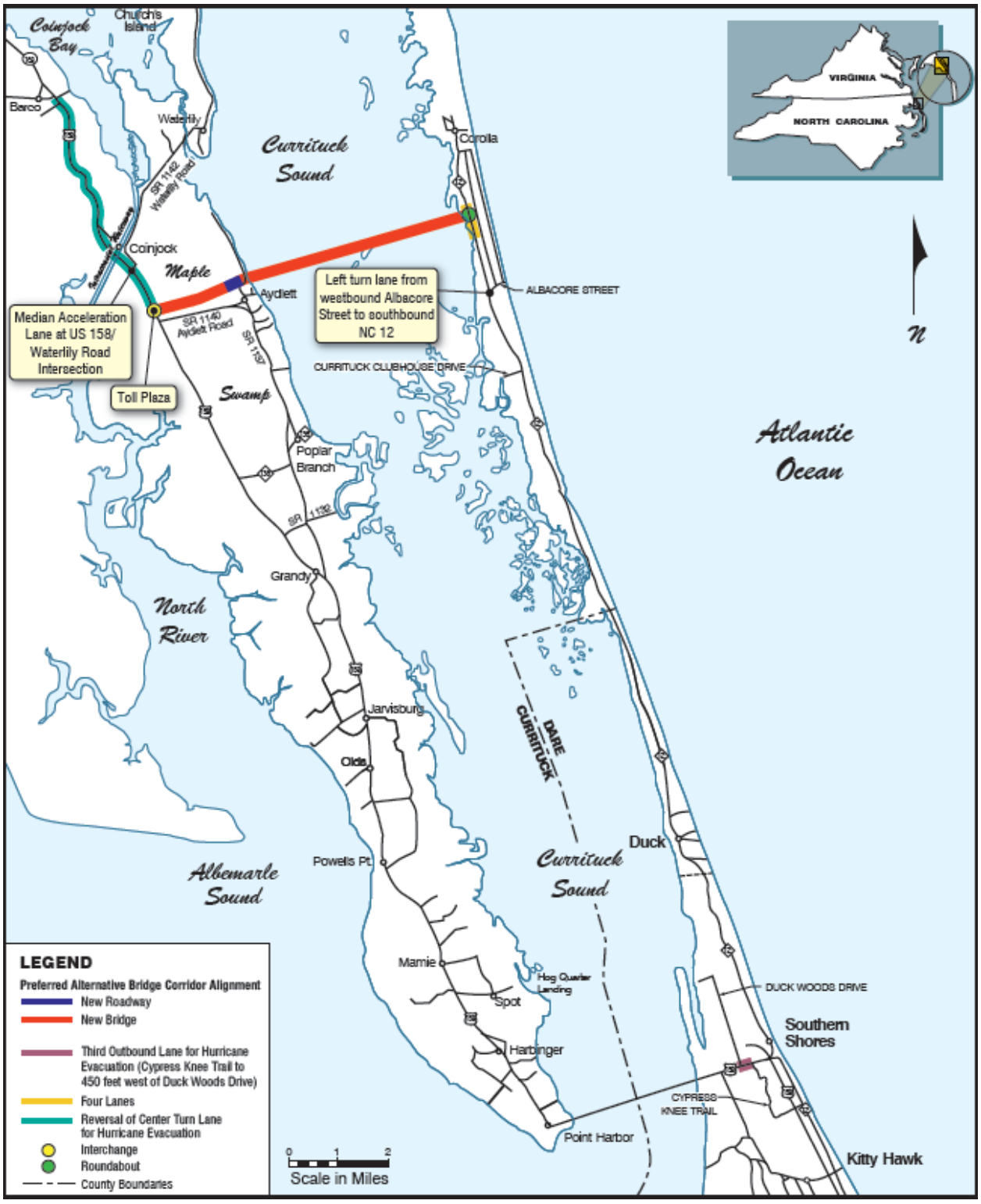

Figure 3. Preferred Alternative (Revised Design)

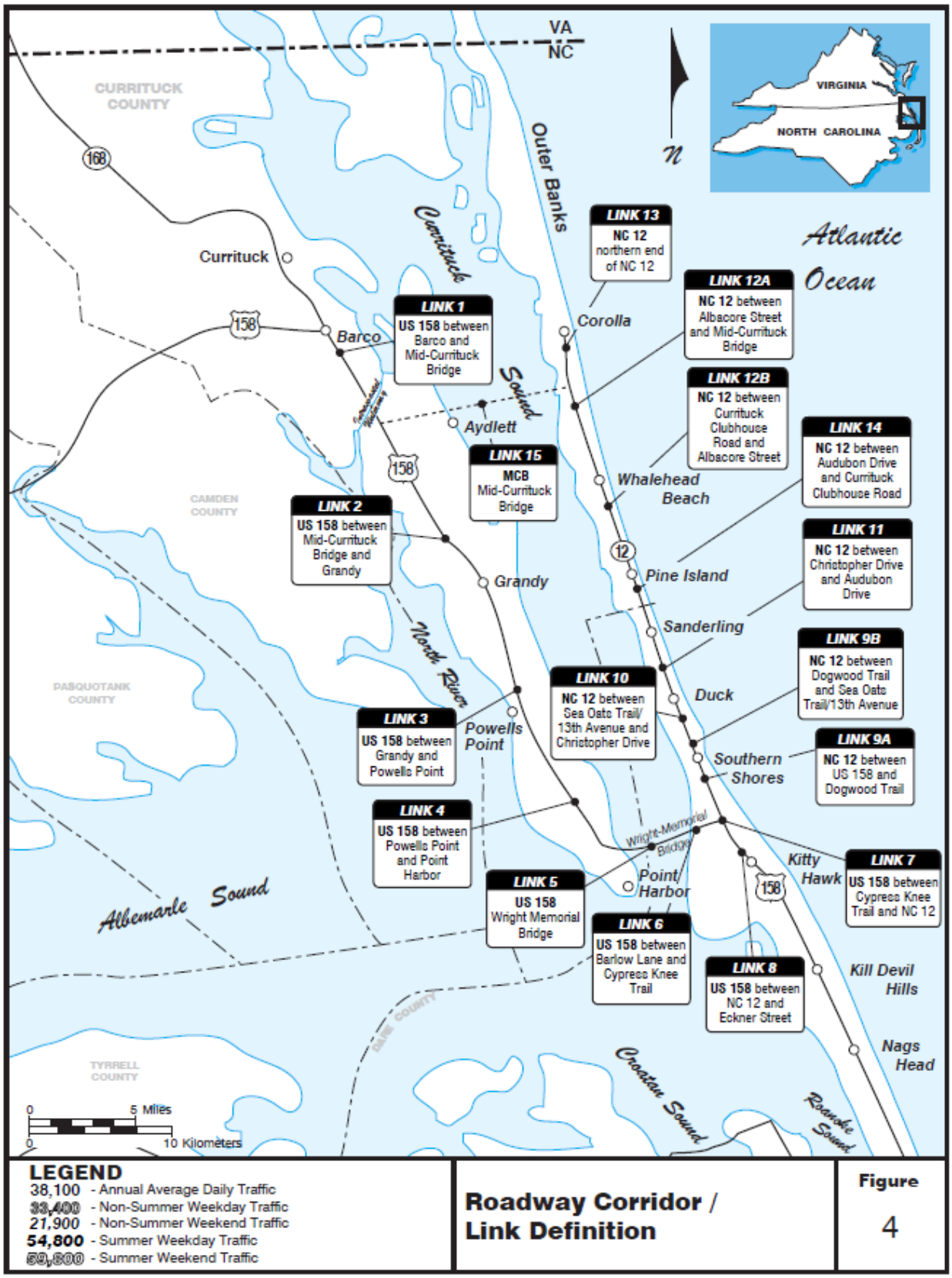

Figure 4. Roadway Corridor (Link) Definition

Table 1. Roadway Cross-Section by Alternative

Link #	Route	Section	Length (mi)	Existing / No-Build	ER2	Preferred Alternative
1	US 158	Barco and Mid-Currituck Bridge	5.17	5-Lane 55 MPH	5-Lane 55 MPH	5-Lane 55 MPH
2	US 158	Mid-Currituck Bridge and Grandy	6.56	5-Lane 55 MPH	5-Lane 55 MPH	5-Lane 55 MPH
3	US 158	Grandy and Powells Point	6.12	5-Lane 55 MPH	5-Lane 55 MPH	5-Lane 55 MPH
4	US 158	Powells Point and Point Harbor	6.66	5-Lane 55 MPH	5-Lane 55 MPH	5-Lane 55 MPH
5	US 158	Wright Memorial Bridge	3.27	5-Lane 55 MPH	5-Lane 55 MPH	5-Lane 55 MPH
6	US 158	Barlow Lane and Cypress Knee Trail	0.92	5-Lane Arterial	6-Lane Superstreet	5-Lane Arterial
7	US 158	Cypress Knee Trail and NC 12	0.48	5-Lane Arterial	6-Lane Superstreet	5-Lane Arterial
8	US 158	NC 12 and Eckner Street	1.13	5-Lane Arterial	5-Lane Arterial	5-Lane Arterial
9A	NC 12	US 158 and Dogwood Trail	2.29	3-Lane TWLTL Arterial	3-Lane TWLTL Arterial	3-Lane TWLTL Arterial
9B	NC 12	Dogwood Trail and Sea Oats Trail/13th Avenue	2.34	2-Lane Arterial	3-Lane TWLTL Arterial	2-Lane Arterial
10	NC 12	Sea Oats Trail/13th Avenue & Christopher Drive	1.15	3-Lane TWLTL Arterial	3-Lane TWLTL Arterial	3-Lane TWLTL Arterial
11	NC 12	Christopher Drive and Audubon Drive	7.18	2-Lane	2-Lane	2-Lane
14	NC 12	Audubon Dr and Currituck Clubhouse Road	3.02	2-Lane	2-Lane	2-Lane
12B	NC 12	Currituck Clubhouse Road and Albacore St	1.88	3-Lane TWLTL Arterial	3-Lane TWLTL Arterial	3-Lane TWLTL Arterial
12A	NC 12	Albacore St and Mid-Currituck Bridge	1.8	2-Lane	2-Lane	2-Lane
13	NC 12	Northern end of NC 12	1.39	2-Lane	2-Lane	2-Lane
15	MCB	Mid-Currituck Bridge	7	-	-	2-Lane Bridge

2.0 Traffic Forecasts

Traffic forecasts for R-2576 were developed for base year (2015) and future year (2040) in June 2016 and are documented in the *2040 Project Level Traffic Forecast* report.

As noted in Section 1.1, because of the unique nature of beach holiday travel pattern in the study area, the design period for this project is the Summer Weekday instead of the typical AADT. Additional analysis is also needed for the Summer Weekend, which has the peak daily trip volumes.

Detailed traffic forecasts (intersection level) were developed for Summer Weekday and Summer Weekend as per NCDOT Traffic Forecasting guidelines. Link traffic forecasts (corridor level) were developed for AADT, Non-Summer Weekday, Non-Summer Weekend, Summer Weekday and Summer Weekend for the four scenarios.

Most of the analysis in this report is based on link forecasts, except for travel time analysis (Section 5.4), which utilizes peak hour volumes developed from detailed forecasts.

2.1 Link Traffic Forecasts

Roadway corridor level link based forecasts were prepared for evaluation of Purpose and Need for this project. The link traffic forecasts are weighted average (by length) of daily traffic volumes on the constituting segments. The following six (6) scenarios were developed for 16 (+1) specific links for AADT, Non-Summer Weekday, Non-Summer Weekend, Summer Weekday and Summer Weekend (i.e., the link forecasts):

- **2015 Base Year No-Build**
- 2015 Base Year Build without Tolls
- 2015 Base Year Build with Tolls
- **2040 Future Year No-Build**
- **2040 Future Year ER2**
- 2040 Future Year Build without Tolls
- **2040 Future Year Build with Tolls**

The link forecasts for the four scenarios being evaluated in this report emphasized above in **bold**. Table 2 shows link forecasts for 16 (+1) links for the four scenarios. They are also shown in Figure 5 through Figure 7 for each scenario.

Table 2. Link Traffic Forecasts

Link #	Route	Section	Daily Traffic Volume	Base Year Existing (2015)	No Build / ER2 (2040)	Build Bridge w/ Tolls (2040)
1	US 158	Barco and Mid-Currituck Bridge	AADT	17,400	26,100	26,100
			Non-Summer Weekday	14,900	22,300	22,300
			Non-Summer Weekend	16,900	25,200	25,200
			Summer Weekday	19,600	29,300	29,300
			Summer Weekend	43,600	64,200	64,200
2	US 158	Mid-Currituck Bridge and Grandy	AADT	16,400	24,700	18,900
			Non-Summer Weekday	14,000	21,100	16,100
			Non-Summer Weekend	15,800	23,900	18,200
			Summer Weekday	18,400	27,800	21,200
			Summer Weekend	43,000	63,200	47,000
3	US 158	Grandy and Powells Point	AADT	18,600	27,300	20,300
			Non-Summer Weekday	15,900	23,300	17,300
			Non-Summer Weekend	18,000	26,400	19,600
			Summer Weekday	20,900	30,700	22,800
			Summer Weekend	44,900	66,200	48,800
4	US 158	Powells Point and Point Harbor	AADT	21,000	30,600	23,100
			Non-Summer Weekday	17,900	26,100	19,800
			Non-Summer Weekend	20,300	29,600	22,400
			Summer Weekday	23,600	34,400	26,000
			Summer Weekend	47,400	69,200	51,400
5	US 158	Wright Memorial Bridge	AADT	21,000	30,600	23,100
			Non-Summer Weekday	17,900	26,100	19,800
			Non-Summer Weekend	20,300	29,600	22,400
			Summer Weekday	23,600	34,400	26,000
			Summer Weekend	47,400	69,200	51,400

Table 2 (continued). Link Traffic Forecasts

Link #	Route	Section	Daily Traffic Volume	Base Year Existing (2015)	No Build / ER2 (2040)	Build Bridge w/ Tolls (2040)
6	US 158	Barlow Lane and Cypress Knee Trail	AADT	24,600	34,900	27,900
			Non-Summer Weekday	21,000	29,800	23,800
			Non-Summer Weekend	23,700	33,700	26,900
			Summer Weekday	27,600	39,200	31,300
			Summer Weekend	49,600	72,000	55,500
7	US 158	Cypress Knee Trail and NC 12	AADT	29,500	41,400	34,600
			Non-Summer Weekday	25,200	35,300	29,600
			Non-Summer Weekend	28,600	40,000	33,500
			Summer Weekday	33,200	46,500	38,900
			Summer Weekend	55,600	79,400	63,600
8	US 158	NC 12 and Eckner Street	AADT	33,300	43,100	43,100
			Non-Summer Weekday	28,400	36,800	36,800
			Non-Summer Weekend	32,200	41,600	41,600
			Summer Weekday	37,400	48,400	48,400
			Summer Weekend	50,200	69,400	69,400
9A	NC 12	US 158 and Dogwood Trail	AADT	19,800	30,000	23,200
			Non-Summer Weekday	16,900	25,600	19,800
			Non-Summer Weekend	19,100	29,000	22,400
			Summer Weekday	22,200	33,700	26,100
			Summer Weekend	27,400	42,200	26,400
9B	NC 12	Dogwood Trail and Sea Oats Trail / 13th Avenue	AADT	17,900	28,700	21,500
			Non-Summer Weekday	15,300	24,500	18,400
			Non-Summer Weekend	17,300	27,700	20,800
			Summer Weekday	20,100	32,200	24,200
			Summer Weekend	26,700	41,300	24,500

Table 2 (continued). Link Traffic Forecasts

Link #	Route	Section	Daily Traffic Volume	Base Year Existing (2015)	No Build / ER2 (2040)	Build Bridge w/ Tolls (2040)
10	NC 12	Sea Oats Trail / 13th Avenue and Christopher Drive	AADT	16,000	27,000	19,500
			Non-Summer Weekday	13,700	23,000	16,600
			Non-Summer Weekend	15,500	26,100	18,800
			Summer Weekday	18,000	30,300	21,900
			Summer Weekend	24,500	40,300	22,500
11	NC 12	Christopher Drive and Audubon Drive	AADT	12,600	23,300	15,800
			Non-Summer Weekday	10,800	19,900	13,500
			Non-Summer Weekend	12,200	22,500	15,300
			Summer Weekday	14,200	26,200	17,800
			Summer Weekend	20,900	36,400	18,500
14	NC 12	Audubon Drive and Currituck Clubhouse Road	AADT	12,200	22,800	17,100
			Non-Summer Weekday	10,400	19,500	14,600
			Non-Summer Weekend	11,800	22,000	16,500
			Summer Weekday	13,700	25,600	19,200
			Summer Weekend	20,600	31,100	18,700
12B	NC 12	Currituck Clubhouse Road and Albacore Street	AADT	13,600	21,800	18,900
			Non-Summer Weekday	11,600	18,600	16,100
			Non-Summer Weekend	13,200	21,100	18,200
			Summer Weekday	15,300	24,500	21,200
			Summer Weekend	20,200	25,700	23,400
12A	NC 12	Albacore Street and Mid-Currituck Bridge	AADT	10,500	13,500	15,800
			Non-Summer Weekday	9,000	11,600	13,500
			Non-Summer Weekend	10,100	13,100	15,300
			Summer Weekday	11,800	15,200	17,800
			Summer Weekend	14,300	16,000	21,200

Table 2 (concluded). Link Traffic Forecasts

Link #	Route	Section	Daily Traffic Volume	Base Year Existing (2015)	No Build / ER2 (2040)	Build Bridge w/ Tolls (2040)
13	NC 12	Northern end of NC 12	AADT	9,500	10,900	10,900
			Non-Summer Weekday	8,100	9,300	9,300
			Non-Summer Weekend	9,200	10,500	10,500
			Summer Weekday	10,700	12,200	12,200
			Summer Weekend	12,700	13,400	13,400
15	MCB	Mid-Currituck Bridge	AADT	-	-	7,700
			Non-Summer Weekday	-	-	6,500
			Non-Summer Weekend	-	-	7,400
			Summer Weekday	-	-	8,600
			Summer Weekend	-	-	18,000

2.1.1 2015 Existing Conditions

The link-based forecasts for Existing (2015) conditions are shown in Figure 5.

2.1.2 2040 No-Build Alternative and ER2

The Future Year (2040) No-Build Alternative link forecasts are shown in Figure 6. The No-Build Alternative and ER2 forecasts are identical.

2.1.3 2040 Build Preferred Alternative

The Future Year (2040) Build Preferred Alternative with Tolls alternative link forecasts are shown in Figure 7.

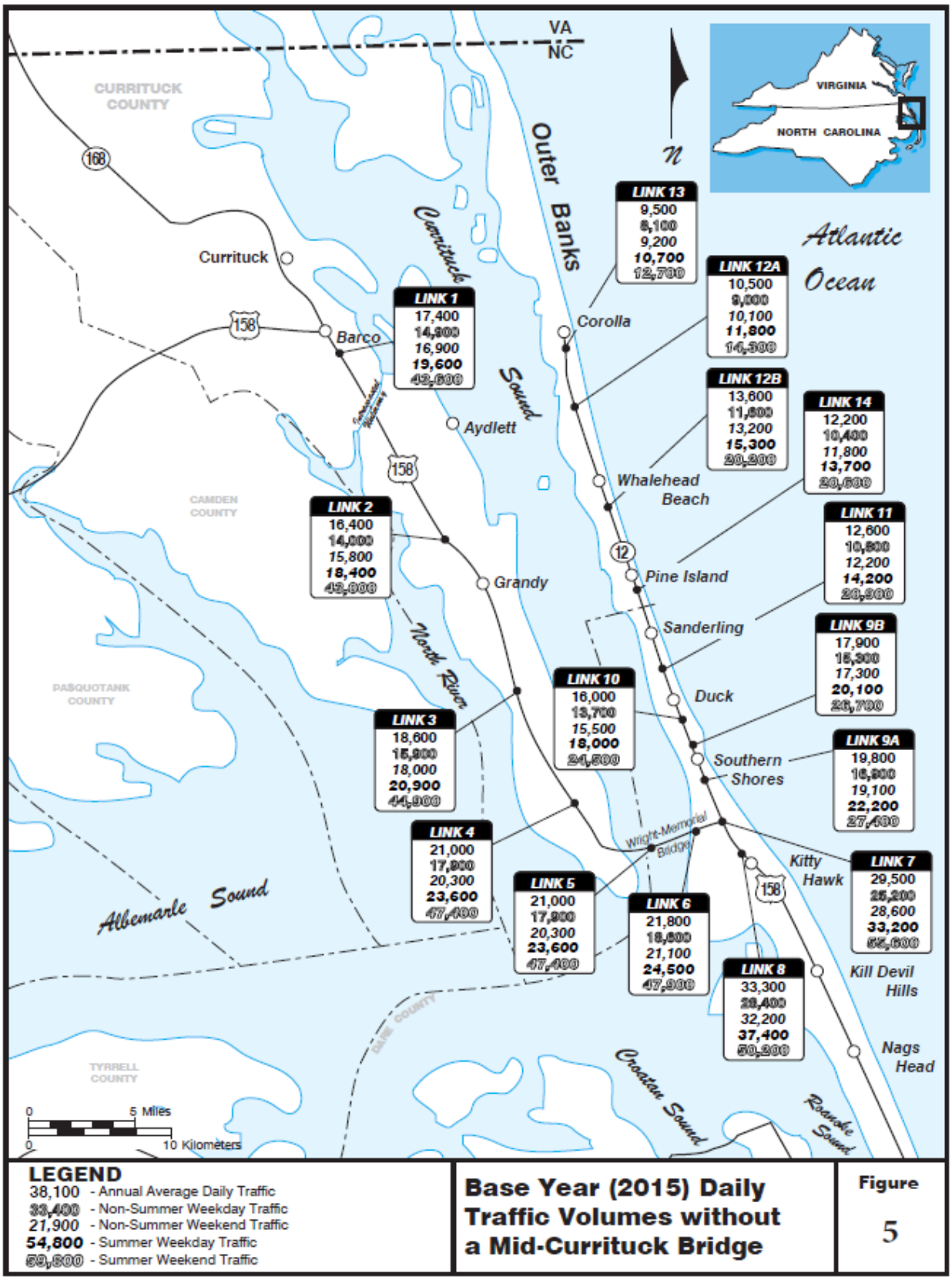

Figure 5. Existing (2015) Daily Traffic Volumes

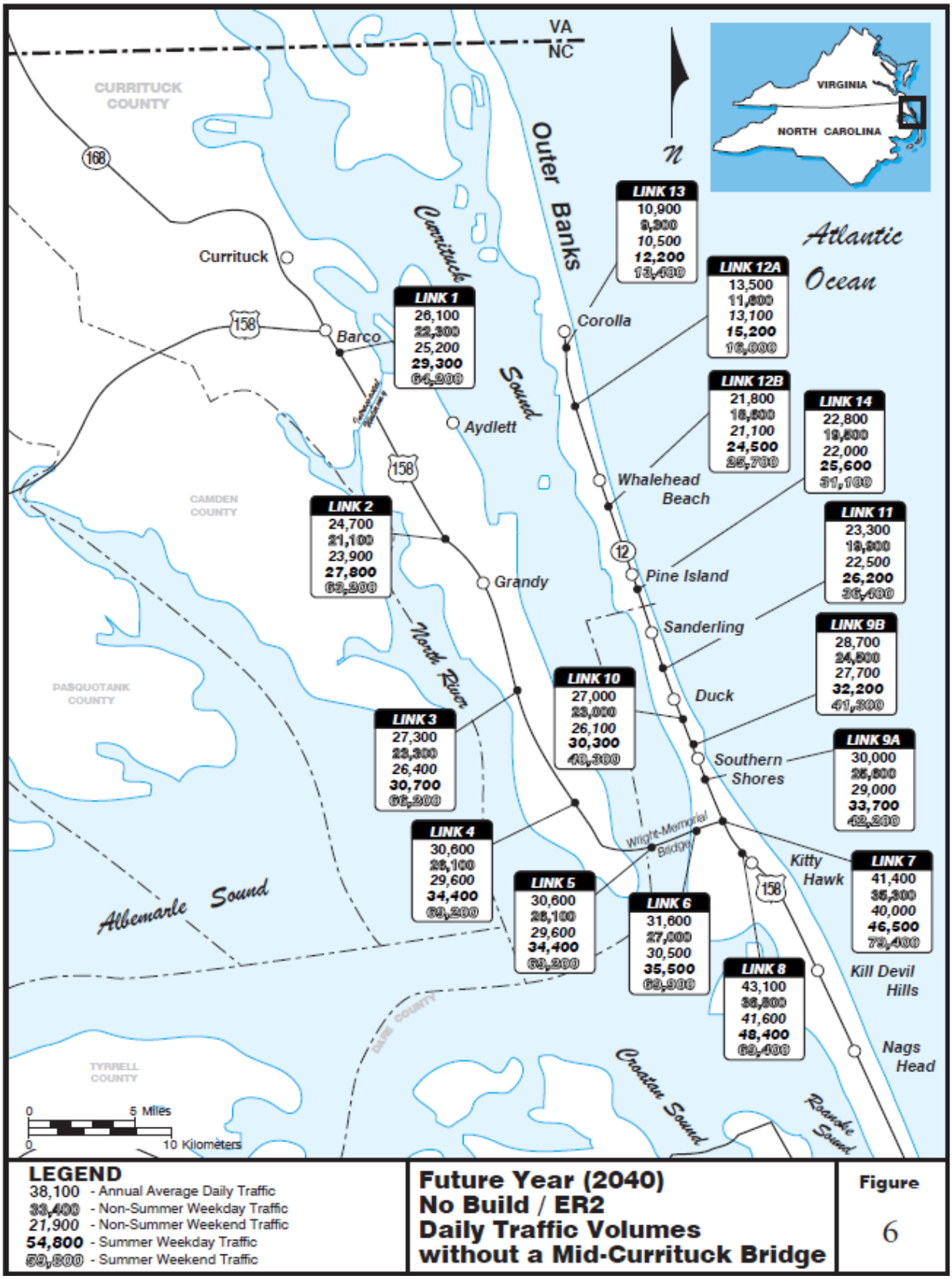

Figure 6. Future Year (2040) No-Build / ER2 Daily Traffic Volumes

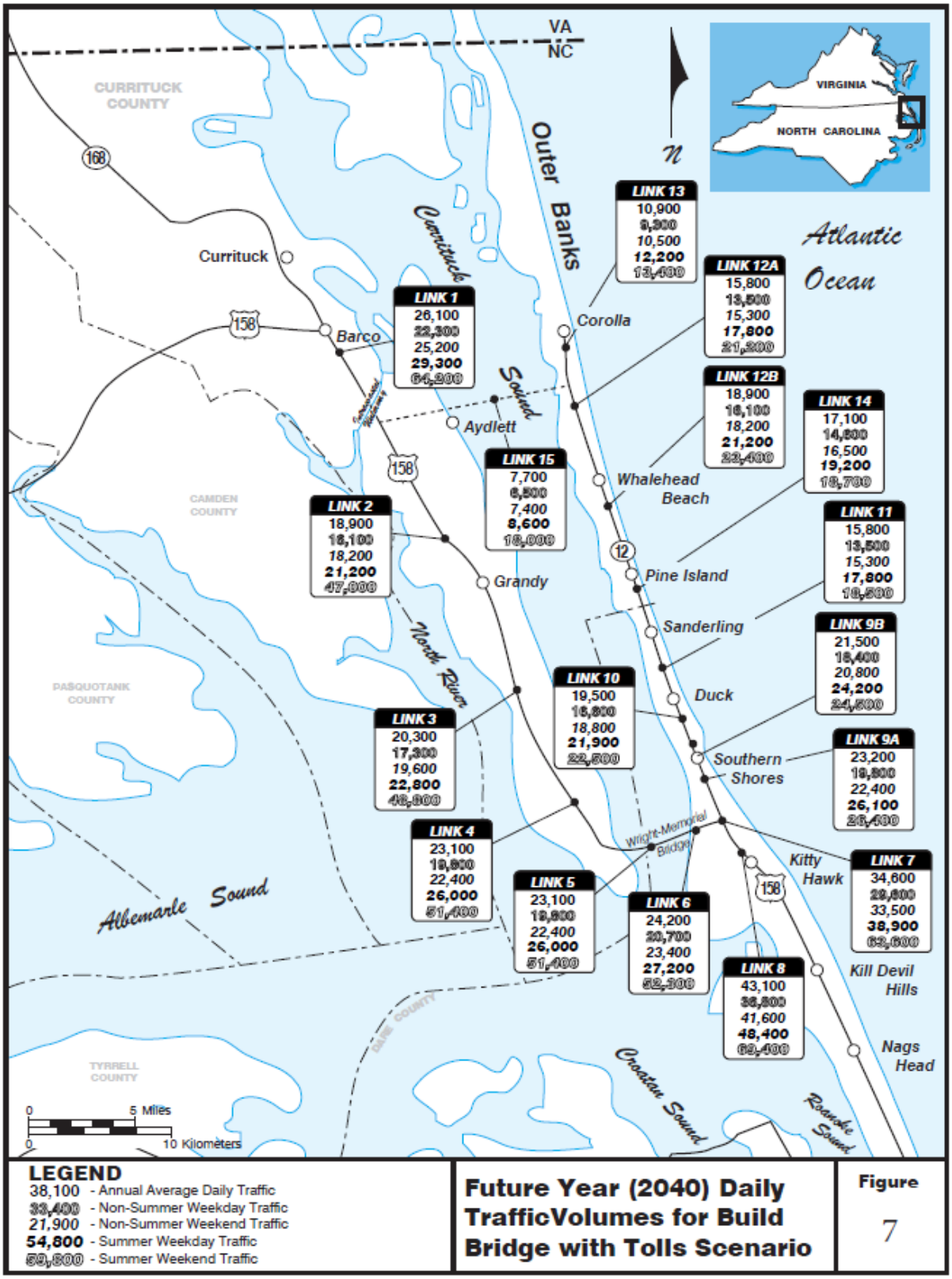

Figure 7. Future Year (2040) Build Preferred Alternative with Tolls Alternative Daily Traffic Volumes

2.2 Hourly Traffic Volumes

The daily forecasts provided were developed for 16 (+1) links in the study area. To provide capacity analysis for the roadway links, peaking characteristics and other traffic flow characteristics were identified in the 2040 Traffic Forecast Report. The details impacting the capacity analysis are summarized in this section.

2.2.1 Traffic Characteristics of Roadway Network

The traffic analyses for this project utilized traffic diurnal profiles derived from traffic counts collected in summer of 2015. Count data and diurnal profile from NCDOT's Automatic Traffic Recorder (ATR) station A2703 on the Wright Memorial Bridge was also utilized in addition to the project-level traffic counts.

The temporal distribution of traffic counts along NC 12 and US 158 were analyzed and general findings include:

- During Summer Weekday conditions, traffic volumes along NC 12 have a traditional AM and PM peak although traffic volumes throughout the day are only slightly less than the peak hour flows.

- On summer Saturdays, traffic volumes along NC 12 are higher than on weekdays and peak period traffic volumes exceed weekday peak period volumes for a longer timeframe, from 8 AM to 8 PM.

- On summer Sundays, NC 12 traffic volumes are less than Saturdays, but still exceed peak weekday levels from 10 AM to 5 PM.

2.2.2 Computation of Hourly Link Volumes

Using the traffic data collected and the analysis of peaking and temporal distribution, traffic flow characteristics were identified for inclusion in the capacity analysis of roadway links.

Hourly traffic count data from Wright Memorial Bridge ATR 2703 was utilized for calculating diurnal profile of all links for AADT, Non-Summer Weekday and Non-Summer Weekend. Average AADT profile, Non-Summer Weekday profile and Non-Summer Weekend profile were calculated based on data between 2008 and 2012 from ATR 2703.

For Summer Weekday and Summer Weekend, hourly data was available from the nineteen classification counts documented in the *2040 Traffic Forecast Report*. After a review of the data, the study area counts were grouped into four zones and an average profile was calculated for each zone:

- Zone A – US 158 between Barco and Wright Memorial Bridge (counts C-1 through C-4)
- Zone B – US 158 from Wright Memorial Bridge to NC 12 (Counts C-5 through C-8)
- Zone C – NC 12 from US 158 to Currituck-Dare County line (Counts C-9A through C-11)
- Zone D – NC 12 from Currituck-Dare County line to Corolla (Counts C-14A through C-13)

Hourly traffic volume factors are provided in Table 3 and hourly peak direction factor are provided in Table 4.

Table 3. Hourly Traffic Volume Factor

	AADT	NS Week-day	NS Week-end	Summer Weekday				Summer Weekend			
Hr	WMB	WMB	WMB	Zone A	Zone B	Zone C	Zone D	Zone A	Zone B	Zone C	Zone D
0	0.6%	0.5%	0.7%	0.8%	0.6%	0.6%	0.4%	0.8%	0.8%	0.7%	0.4%
1	0.4%	0.3%	0.5%	0.5%	0.4%	0.3%	0.2%	0.5%	0.5%	0.5%	0.3%
2	0.3%	0.2%	0.3%	0.3%	0.3%	0.3%	0.2%	0.4%	0.4%	0.4%	0.2%
3	0.3%	0.3%	0.4%	0.4%	0.3%	0.2%	0.2%	0.6%	0.6%	0.7%	0.5%
4	0.6%	0.5%	0.6%	0.8%	0.5%	0.3%	0.2%	1.2%	1.1%	1.5%	1.2%
5	1.4%	1.3%	1.3%	1.6%	1.3%	0.7%	0.4%	2.6%	2.2%	3.1%	2.5%
6	3.2%	3.4%	2.6%	3.4%	3.0%	2.0%	1.5%	4.4%	3.8%	5.1%	4.4%
7	5.6%	6.2%	4.4%	5.6%	5.2%	3.8%	3.2%	7.1%	5.7%	6.7%	5.4%
8	6.8%	7.3%	6.1%	6.2%	6.3%	5.7%	4.9%	8.3%	6.9%	7.2%	6.0%
9	6.7%	6.5%	7.3%	6.2%	6.2%	6.4%	6.1%	9.2%	7.8%	7.6%	6.7%
10	7.0%	6.4%	8.2%	6.6%	6.5%	6.8%	8.0%	9.2%	8.1%	7.6%	7.2%
11	7.1%	6.6%	8.1%	6.7%	6.8%	7.0%	8.1%	8.7%	7.8%	6.9%	6.9%
12	7.1%	6.8%	7.9%	6.6%	6.8%	6.7%	8.0%	7.7%	7.6%	6.4%	6.8%
13	7.1%	6.9%	7.7%	6.8%	6.8%	6.7%	7.6%	6.6%	7.2%	6.0%	6.4%
14	7.2%	7.1%	7.8%	6.7%	6.9%	6.9%	7.4%	5.7%	7.0%	5.8%	6.6%
15	7.5%	7.5%	7.8%	6.9%	7.1%	7.0%	7.6%	5.6%	6.6%	5.6%	7.2%
16	7.7%	8.2%	7.3%	7.1%	7.4%	7.2%	7.6%	4.9%	5.9%	5.8%	6.6%
17	7.2%	7.9%	6.3%	7.1%	7.3%	7.1%	7.3%	4.6%	5.4%	5.2%	5.9%
18	5.1%	5.2%	4.8%	5.6%	5.6%	6.1%	6.0%	3.7%	4.2%	4.6%	5.2%
19	3.7%	3.6%	3.4%	4.4%	4.4%	5.1%	5.0%	2.8%	3.4%	3.9%	4.9%
20	2.8%	2.7%	2.5%	3.5%	3.6%	4.6%	4.6%	2.1%	2.7%	3.3%	4.0%
21	2.2%	2.2%	1.9%	2.8%	3.0%	4.2%	3.2%	1.4%	2.1%	2.6%	2.6%
22	1.5%	1.5%	1.3%	2.0%	2.1%	2.6%	1.7%	1.0%	1.5%	1.8%	1.2%
23	1.0%	0.9%	0.8%	1.4%	1.4%	1.4%	0.8%	0.7%	0.9%	1.1%	0.7%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 4. Hourly Peak Direction Traffic Volume Factor

	AADT	NS Week-day	NS Week-end	Summer Weekday				Summer Weekend			
Hr	WMB	WMB	WMB	Zone A	Zone B	Zone C	Zone D	Zone A	Zone B	Zone C	Zone D
0	62%	63%	60%	63%	60%	57%	57%	65%	60%	57%	60%
1	64%	64%	59%	66%	65%	63%	60%	60%	58%	54%	58%
2	53%	54%	52%	57%	58%	55%	59%	55%	52%	65%	65%
3	55%	51%	64%	55%	55%	58%	57%	67%	71%	83%	84%
4	61%	54%	73%	54%	53%	59%	70%	75%	77%	90%	88%
5	59%	51%	71%	56%	52%	54%	57%	70%	77%	85%	89%
6	51%	57%	63%	54%	55%	61%	55%	66%	69%	73%	72%
7	53%	58%	57%	55%	56%	61%	59%	56%	58%	59%	62%
8	53%	59%	58%	53%	56%	61%	57%	53%	56%	51%	53%
9	54%	51%	63%	53%	52%	54%	53%	50%	55%	51%	55%
10	55%	52%	62%	54%	51%	52%	53%	51%	54%	53%	53%
11	51%	51%	55%	52%	51%	54%	53%	52%	51%	52%	57%
12	51%	51%	51%	52%	51%	51%	51%	53%	55%	56%	57%
13	52%	51%	52%	51%	51%	51%	52%	54%	58%	60%	57%
14	51%	52%	53%	52%	51%	51%	52%	57%	59%	60%	55%
15	50%	53%	53%	52%	52%	53%	54%	57%	59%	59%	55%
16	52%	54%	50%	54%	53%	60%	57%	55%	56%	57%	54%
17	53%	55%	51%	56%	55%	63%	58%	54%	55%	56%	55%
18	52%	53%	52%	54%	51%	57%	54%	62%	53%	59%	60%
19	55%	56%	53%	53%	53%	51%	52%	62%	53%	59%	62%
20	54%	55%	52%	53%	53%	52%	52%	60%	53%	58%	63%
21	54%	55%	53%	54%	54%	54%	58%	61%	52%	58%	59%
22	54%	56%	52%	52%	54%	53%	57%	62%	53%	54%	61%
23	57%	59%	54%	56%	54%	57%	58%	65%	54%	54%	59%

Note: For NC 12 roadway links, two-way analysis is utilized so hourly peak direction factors are not used.

2.2.3 Computation of Peak Hour Turn Movement Volumes

A detailed analysis of peak hour traffic operations at study area intersections was needed as part of the travel time analysis. Peak hour turn movement volumes were developed for the four scenarios for both Summer Weekday and Summer Weekend:

- 2015 Existing Summer Weekday
- 2015 Existing Summer Weekend
- 2040 No-Build Summer Weekday
- 2040 No-Build Summer Weekend

- 2040 ER2 Summer Weekday
- 2040 ER2 Summer Weekend
- 2040 Build (Bridge with Tolls) Summer Weekday
- 2040 Build (Bridge with Tolls) Summer Weekend

These turn movement volumes for AM and PM peak hours were calculated based on the detailed traffic forecasts by utilizing NCDOT's latest Intersection Analysis Utility (IAU) spreadsheet. In all, 16 sets of peak hour volumes and 16 synchro networks were developed for travel time analysis.

Note that 2040 No-Build and ER2 scenario have identical traffic forecasts but ER2 assumes capacity improvements east of the Wright Memorial Bridge and volume adjustments due to superstreet configuration.

Peak hour volumes in synchro were not balanced. Peak hour volumes were only balanced near the intersection of US 158 and NC 12, and at the two ends of the proposed bridge in the Build scenario.

3.0 Roadway Congestion Measures

3.1 Level of Service

Level of service (LOS) is a performance measure indicating the quality of traffic flow. The LOS performance measure used in this project is based on definitions outlined in the *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis (HCM 6E) (Transportation Research Board, 2016).* The analysis used in this study uses the methodology described in the following chapters of HCM 6E:

- Chapter 6. HCM and Alternative Analysis Tools
- Chapter 7. Interpreting HCM and Alternative Tool Results,
- Chapter 12. Basic Freeway and Multilane Highway Segments,
- Chapter 15. Two-Lane Highways,
- Chapter 16. Urban Street Facilities,
- Chapter 18. Urban Street Segments,
- Chapter 29. Urban Street Facilities: Supplemental,
- Chapter 30. Urban Street Segments: Supplemental, and
- Section B through K. Planning and Preliminary Engineering Applications Guide to the HCM.

HCM 2016 LOS methodology ranks the quality of traffic flow using a lettering system ranging from LOS A to LOS F. In this measurement scale, LOS A represents free-flow traffic conditions and LOS F represents forced or breakdown traffic flow. LOS E represents traffic operations at or near capacity. Table 5 presents the level of service concept as summarized in the HCM 2010 and definitions for each level of service.

3.1.1 Desired Level of Service

In general, American Association of State Highway and Transportation Officials (AASHTO) guidelines indicate that LOS C is considered desirable in rural areas, but in urban areas the desirable LOS could drop to D, but is not considered ideal. LOS E is generally considered less than desirable. In addition, the AASHTO Policy on Geometric Design of Highways and Streets acknowledges that design LOS may vary for specific circumstances and projects at the discretion of the designer.

Table 5. Level of Service Definitions

Level of Service Classification	Roadway Expected Flow Characteristics	Signalized Intersections Stopped Delay per Vehicle
A	Free flowing traffic.	Most vehicles do not stop; average control delay per vehicle less than or equal to 10 seconds.
B	A stable flow with few restrictions on operating speed.	More vehicles stop, but good progression and short cycle lengths. Average control delay per vehicle is between 10.1 and 20.0 seconds.
C	Stable flow but with more restrictions on speed and lane changing.	A large number of vehicles are stopped, although many still pass through. Individual cycle failures[1] may appear. Average control delay per vehicle is between 20.1 and 35.0 seconds.
D	Approaches unstable conditions and passing becomes extremely difficult. Motorists are delayed an average of 75 percent of the time. Average highway speeds are less than 45 mph.	The proportion of vehicles stopping continues to rise. Individual cycle failures are noticeable. Average control delay per vehicle is between 35.1 and 55 seconds.
E	The capacity of a roadway. Passing is virtually impossible and average highway speeds can be as low as 25 mph when slow vehicles or other interruptions are encountered.	The limit of acceptable delay. Individual cycle failures[1] are frequent occurrences. Average control delay per vehicle is between 55.1 and 80 seconds.
F	Heavily congested flow with traffic demand exceeding the capacity of the highway.	Arrival flow rate exceeds the capacity of the intersection. Average control delay per vehicle exceeds 80 seconds.

Note: A cycle failure occurs when an individual vehicle has to wait through more than one red phase.

For this project, it is acknowledged that there are special circumstances related to tourist traffic, particularly on summer weekends. For this reason, the design period has been identified as the summer weekday with consideration of summer weekend operations. Taking this into account, the goal of this project is to achieve LOS D for the summer weekday and at least LOS E on the summer weekend. Despite these goals, it is acknowledged that other issues (such as relocations or environmental impacts) may require consideration of LOS operations less than identified in this project goal.

For this study, the 2040 peak period LOS was estimated on US 158 and NC 12 for the average summer weekend day, the average summer weekday, the average non-summer weekday, the average non-summer weekend day, and the average annual day. For the study area, the goal was to test roadway alternatives and non-highway strategies to maintain LOS D traffic operations during a typical summer weekday.

3.2 Generalized Service Volume Table

The development of the level of service table was based upon HCM 6.0 methodology methods with some modifications to provide consistency with previous analysis. The previous analysis, conducted in 2008, utilized the 2000 Highway Capacity Manual (HCM2000). Since that analysis was completed, however, the HCM 6.0 was released in 2016. For the network congestion analysis, Two-Lane Highways (Chapter 15) and Multilane Highways (Chapter 14) methods were used to identify the peak hour thresholds at which LOS operations changed a letter grade.

3.2.1 NC 12 – Two Lane

For the development of lookup tables for the NC 12 two-lane analysis, a two-lane section for NC 12 and a two-lane section for the proposed bridge. Basic roadway characteristics and traffic flow characteristics on NC 12 were applied.

For NC 12, it was recognized that operations in the southern Dare sections operated more as an arterial while section north of Duck operated more as a standard two-lane highway. Therefore, it was assumed that the NC 12 capacity was reduced by 25 percent in arterial sections representing a G/C ratio of approximately 75 percent on NC 12. In addition, it was estimated that the addition of a third lane would increase capacity by approximately 13 percent.

In the preparation of the two-lane lookup tables, a difference was noted in the determination of LOS between the 2000 and 2010 HCS methodologies. While the LOS F thresholds were similar, there was a discrepancy noted in the LOS E threshold (i.e. the point where LOS D volumes become LOS E). In the new methodology, the LOS C threshold was much lower than utilized in the previous analysis. Specifically, the new methodology indicated LOS E operations occurred at a V/C ratio of approximately 0.5 instead of 0.7 as in the previous analysis. This was critical to the network congestion analysis utilizes this ratio in determining the total amount of congestion in the network. With the lower threshold, higher network congestion levels were indicated in the 2040 analysis as compared with the previous 2035 analysis for both the No-Build and Build scenarios. This is shown in Table 6 and Table 7.

Table 6. Two-Lane Highway LOS Calculation Inputs

HCM 6th Edition Input	Two-Lane (NC 12)
Cross-section	Two-Lane
Class	Class III
Segment Length (mi)	4.0
Lanes in each direction	1
Lane Width (feet)	12
Shoulder Width (feet)	2
Terrain	Level
Access-Point Density	16
Free-Flow Speed Method	Estimated
Base Free Flow Speed (mph)	52
Trucks and Buses	2%
Recreational Vehicles	5%
Directional Split	60-40
Peak Hour Factor	0.90
Percent No-Passing Zones	100%
Passenger-Car Equivalents for Trucks	1.0
Passenger-Car Equivalents for RVs	1.0

Table 7. Generalized Service Volumes for Two-Lane and Three-Lane Cross-Sections along NC 12 (Two-Way)

Cross-Section	A | B	B | C	C | D	D | E	E | F	F | Bad F	Methodology
2-Lane	158	434	1,034	1,580	2,550	3,315	Based on HCM 6E Chapter 15: Two-Lane Highways; with assumptions in Table 6
2-Lane Arterial	119	326	776	1,185	1,913	2,487	25% lower than 2-Lane based on g/C = 0.75
3-Lane TWLTL	179	490	1,168	1,785	2,882	3,747	13% higher than 2-Lane
3-Lane TWLTL Arterial	134	368	877	1,339	2,162	2,811	13% higher than 2-Lane Arterial

3.2.2 Mid-Currituck Bridge

e two-lane Mid-Currituck Bridge

Table 8 and Table 9 show the LOS inputs for the two-lane Mid-Currituck Bridge

Table 8. Two-Lane Bridge Highway LOS Calculation Inputs

HCM 6th Edition Input	Two-Lane (Mid-Currituck Bridge)
Cross-section	Two-Lane
Class	Class I
Segment Length (mi)	7.0
Lanes in each direction	1
Lane Width (feet)	12
Shoulder Width (feet)	4
Terrain	Level
Access-Point Density	0
Free-Flow Speed Method	Estimated
Base Free Flow Speed (mph)	60
Trucks and Buses	2%
Recreational Vehicles	5%
Directional Split	60-40
Peak Hour Factor	0.90
Percent No-Passing Zones	100%
Passenger-Car Equivalents for Trucks	1.0
Passenger-Car Equivalents for RVs	1.0

Table 9. Generalized Service Volumes for Two-Lane Mid-Currituck Bridge (Two-Way)

Cross-Section	A | B	B | C	C | D	D | E	E | F	F | Bad F	Methodology
2-Lane Bridge	40	236	484	1,006	2,550	3,315	Based on HCM 6E Chapter 15: Two-Lane Highways; with assumptions in e two-lane Mid-Currituck Bridge Table 8

3.2.3 US 158 – Multi-Lane

For the development of lookup tables for the US 158 multi-lane analysis, two basic sections were analyzed and then factored for alternative treatments. Basic roadway characteristics and traffic flow characteristics on US 158 were applied. A multi-lane 55 mph posted speed analysis was conducted for US 158 in Currituck County on the mainland section. For US 158 east of the Wright Memorial Bridge in Dare County, however, a look-up table was developed reflecting a 45-mph posted speed.

This 45-mph capacity table was then factored to account for arterial operations on this section. In general, the capacity was reduced by 30 percent to account for arterial flow assuming a G/C ratio of 0.70 for US 158 for the overall corridor reflecting delays from the four traffic signals on this section. For the effect of a superstreet section, the capacity was estimated to be 25 percent greater than a multi-lane arterial. The use of a G/C ratio and 25 percent factor for a superstreet is consistent with the previous analysis and appropriate for this planning level review.

Table 10 and Table 11 show the LOS inputs for US 158-multi-lanes.

3.2.4 Capacity LOS Thresholds Lookup Table

The capacity analysis outlined above was utilized to identify the LOS thresholds for each breakpoint ranging from LOS A to LOS F. In addition, the LOF F capacity (V/C=1.0) was multiplied to determine very highly congested conditions (V/C=1.3) to be consistent with previous analysis. In addition, it should be noted that the lookup table for a four-lane road reflects volumes in the peak direction of flow only while the two-lane thresholds were based upon volumes in both directions. In the hourly congestion spreadsheet, the appropriate hourly volume was utilized in the determination of V/C and LOS grades.

As noted previously, the network congestion review is a planning level review and not intended to be a detailed capacity/ simulation analysis of network congestion. As such, the use of this sketch planning methodology (i.e. lookup tables based on HCS

Table 10. Multi-Lane Highway Capacity Calculation Inputs

HCM 6th Edition Input	Multi-Lane (US 158)
Cross-section	Four-Lane
Lanes in each direction	2
Median Type	TWLTL
Lane Width (feet)	12
Right Side Clearance (feet)	6
Terrain	Level
Access-Point Density	4
Free-Flow Speed Method	Estimated
Base Free Flow Speed (mph)	60 / 50
Total Trucks %	2%
Directional Split	60-40
Peak Hour Factor	0.90
Driver Population	Balanced Mix
Capacity Adjustment Factor	0.939
Speed Adjustment Factor	0.950

Table 11. Generalized Service Volumes for Five-Lane and Six-Lane Cross-Sections along US 158 (One-Way)

Cross-Section	A | B	B | C	C | D	D | E	E | F	F | Bad F	Methodology
5-Lane 55 MPH	1,092	1,783	2,570	3,153	3,513	4,567	HCM 6E Multi-Lane Highway; with Base FFS = 60 mph; and inputs in Table 10
5-Lane 45 MPH	910	1,484	2,142	2,800	3,204	4,165	HCM 6E Multi-Lane Highway; with Base FFS = 50 mph; and inputs in Table 10
5-Lane Arterial	637	1,039	1,499	1,960	2,243	2,916	30% Lower than 5-Lane 45 MPH Multi-Lane Highway, g/C = 0.70
6-Lane Arterial	956	1,559	2,249	2,940	3,365	4,375	50% higher than 5-Lane Arterial
6-Lane Superstreet	1,195	1,949	2,811	3,675	4,206	5,468	25% higher than 6-Lane Arterial

Using software HCS 7.2.1.

methodology) is appropriate. In addition, it is consistent with the type of analysis conducted in the previous network congestion analysis.

Table 9, and Table 11 provide a summary of the lookup tables applied in the network capacity analysis for a total of 10 section types. Note that not all 10 types were applied, since some were developed and then factored to account for unique roadway characteristics (such as a superstreet, fifth lane, or widening). The LOS thresholds in the table was applied to each of the 16 links in the roadway network for computations of network delays and summaries.

3.3 LOS and V/C Ratio

Table 12 shows the level of service and volume/capacity ratios for project area roadway sections.

Table 12. Level of Service & V/C Ratios for Roadway Sections

Link #	Route	Between	Alternative	Cross-Section	AADT		Non-Summer Weekday		Non-Summer Weekend		Summer Weekday		Summer Weekend	
					LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
1	US 158	Barco and Mid-Currituck Bridge	Existing (2015)	5-Lane 55 MPH	A	0.20	A	0.19	A	0.25	A	0.22	C	0.58
			No-Build (2040)	5-Lane 55 MPH	A	0.30	A	0.28	B	0.37	B	0.34	D	0.86
			ER2 (2040)	5-Lane 55 MPH	A	0.30	A	0.28	B	0.37	B	0.34	D	0.86
			Build (2040)	5-Lane 55 MPH	A	0.30	A	0.28	B	0.37	B	0.34	D	0.86
2	US 158	Mid-Currituck Bridge and Grandy	Existing (2015)	5-Lane 55 MPH	A	0.19	A	0.18	A	0.23	A	0.21	C	0.58
			No-Build (2040)	5-Lane 55 MPH	A	0.28	A	0.27	B	0.35	B	0.32	D	0.85
			ER2 (2040)	5-Lane 55 MPH	A	0.28	A	0.27	B	0.35	B	0.32	D	0.85
			Build (2040)	5-Lane 55 MPH	A	0.22	A	0.20	A	0.27	A	0.24	C	0.63
3	US 158	Grandy and Powells Point	Existing (2015)	5-Lane 55 MPH	A	0.21	A	0.20	A	0.26	A	0.24	C	0.60
			No-Build (2040)	5-Lane 55 MPH	B	0.31	A	0.30	B	0.39	B	0.35	D	0.89
			ER2 (2040)	5-Lane 55 MPH	B	0.31	A	0.30	B	0.39	B	0.35	D	0.89
			Build (2040)	5-Lane 55 MPH	A	0.23	A	0.22	A	0.29	A	0.26	C	0.65
4	US 158	Powells Point and Point Harbor	Existing (2015)	5-Lane 55 MPH	A	0.24	A	0.23	A	0.30	A	0.27	C	0.63
			No-Build (2040)	5-Lane 55 MPH	B	0.35	B	0.33	B	0.43	B	0.39	E	0.93
			ER2 (2040)	5-Lane 55 MPH	B	0.35	B	0.33	B	0.43	B	0.39	E	0.93
			Build (2040)	5-Lane 55 MPH	A	0.27	A	0.25	B	0.33	A	0.30	C	0.69
5	US 158	Wright Memorial Bridge	Existing (2015)	5-Lane 55 MPH	A	0.24	A	0.23	A	0.30	A	0.27	C	0.63
			No-Build (2040)	5-Lane 55 MPH	B	0.35	B	0.33	B	0.43	B	0.39	E	0.93
			ER2 (2040)	5-Lane 55 MPH	B	0.35	B	0.33	B	0.43	B	0.39	E	0.93
			Build (2040)	5-Lane 55 MPH	A	0.27	A	0.25	B	0.33	A	0.30	C	0.69
6	US 158	Barlow Lane and Cypress Knee Trail	Existing (2015)	5-Lane Arterial	B	0.44	B	0.42	C	0.54	C	0.49	E	0.96
			No-Build (2040)	5-Lane Arterial	C	0.63	C	0.59	D	0.77	D	0.70	F	1.40
			ER2 (2040)	6-Lane Superstreet	B	0.34	B	0.32	B	0.41	B	0.37	D	0.75
			Build (2040)	5-Lane Arterial	C	0.50	C	0.47	C	0.62	C	0.56	F	1.08

Table 12 (continued). Level of Service & V/C Ratios for Roadway Sections

Link #	Route	Between	Alternative	Cross-Section	AADT		Non-Summer Weekday		Non-Summer Weekend		Summer Weekday		Summer Weekend	
					LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
7	US 158	Cypress Knee Trail and NC 12	Existing (2015)	5-Lane Arterial	C	0.53	C	0.50	C	0.66	C	0.60	F	1.08
			No-Build (2040)	5-Lane Arterial	D	0.75	D	0.70	E	0.92	D	0.83	F	1.54
			ER2 (2040)	6-Lane Superstreet	B	0.40	B	0.38	C	0.49	B	0.44	D	0.82
			Build (2040)	5-Lane Arterial	C	0.62	C	0.59	D	0.77	D	0.70	F	1.23
8	US 158	NC 12 and Eckner Street	Existing (2015)	5-Lane Arterial	C	0.60	C	0.57	D	0.74	D	0.67	E	0.97
			No-Build (2040)	5-Lane Arterial	D	0.78	D	0.73	E	0.95	D	0.87	F	1.35
			ER2 (2040)	5-Lane Arterial	D	0.78	D	0.73	E	0.95	D	0.87	F	1.35
			Build (2040)	5-Lane Arterial	D	0.78	D	0.73	E	0.95	D	0.87	F	1.35
9A	NC 12	US 158 and Dogwood Trail	Existing (2015)	3-Lane TWLTL Arterial	E	0.71	E	0.64	E	0.73	E	0.74	E	0.96
			No-Build (2040)	3-Lane TWLTL Arterial	F	1.07	E	0.97	F	1.11	F	1.12	F	1.48
			ER2 (2040)	3-Lane TWLTL Arterial	F	1.07	E	0.97	F	1.11	F	1.12	F	1.48
			Build (2040)	3-Lane TWLTL Arterial	E	0.83	E	0.75	E	0.85	E	0.87	E	0.93
9B	NC 12	Dogwood Trail and Sea Oats Trail / 13th Avenue	Existing (2015)	2-Lane Arterial	E	0.72	E	0.66	E	0.75	E	0.76	F	1.06
			No-Build (2040)	2-Lane Arterial	F	1.16	F	1.05	F	1.19	F	1.21	F	1.64
			ER2 (2040)	3-Lane TWLTL Arterial	F	1.02	E	0.93	F	1.06	F	1.07	F	1.45
			Build (2040)	2-Lane Arterial	E	0.87	E	0.79	E	0.90	E	0.91	E	0.97
10	NC 12	Sea Oats Trail / 13th Avenue and Christopher Drive	Existing (2015)	3-Lane TWLTL Arterial	D	0.57	D	0.52	D	0.59	D	0.60	E	0.86
			No-Build (2040)	3-Lane TWLTL Arterial	E	0.96	E	0.87	E	1.00	F	1.01	F	1.42
			ER2 (2040)	3-Lane TWLTL Arterial	E	0.96	E	0.87	E	1.00	F	1.01	F	1.42
			Build (2040)	3-Lane TWLTL Arterial	E	0.70	E	0.63	E	0.72	E	0.73	E	0.79

Table 12 (concluded). Level of Service & V/C Ratios for Roadway Sections

Link #	Route	Between	Alternative	Cross-Section	AADT		Non-Summer Weekday		Non-Summer Weekend		Summer Weekday		Summer Weekend	
					LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
11	NC 12	Christopher Drive and Audubon Drive	Existing (2015)	2-Lane	C	0.38	C	0.35	C	0.39	C	0.40	E	0.62
			No-Build (2040)	2-Lane	E	0.71	E	0.64	E	0.73	E	0.74	F	1.09
			ER2 (2040)	2-Lane	E	0.71	E	0.64	E	0.73	E	0.74	F	1.09
			Build (2040)	2-Lane	D	0.48	D	0.44	D	0.49	D	0.50	D	0.55
14	NC 12	Audubon Drive and Currituck Clubhouse Road	Existing (2015)	2-Lane	C	0.37	C	0.34	C	0.38	D	0.43	D	0.58
			No-Build (2040)	2-Lane	E	0.69	E	0.63	E	0.71	E	0.81	E	0.88
			ER2 (2040)	2-Lane	E	0.69	E	0.63	E	0.71	E	0.81	E	0.88
			Build (2040)	2-Lane	D	0.52	D	0.47	D	0.53	D	0.61	D	0.53
12B	NC 12	Currituck Clubhouse Road and Albacore Street	Existing (2015)	3-Lane TWLTL Arterial	D	0.49	D	0.44	D	0.50	D	0.57	E	0.68
			No-Build (2040)	3-Lane TWLTL Arterial	E	0.78	E	0.71	E	0.80	E	0.92	E	0.86
			ER2 (2040)	3-Lane TWLTL Arterial	E	0.78	E	0.71	E	0.80	E	0.92	E	0.86
			Build (2040)	3-Lane TWLTL Arterial	E	0.67	D	0.61	E	0.69	E	0.79	E	0.78
12A	NC 12	Albacore Street and Mid-Currituck Bridge	Existing (2015)	2-Lane	C	0.32	C	0.29	C	0.33	C	0.37	D	0.41
			No-Build (2040)	2-Lane	D	0.41	C	0.37	D	0.42	D	0.48	D	0.45
			ER2 (2040)	2-Lane	D	0.41	C	0.37	D	0.42	D	0.48	D	0.45
			Build (2040)	2-Lane	D	0.48	D	0.44	D	0.49	D	0.56	D	0.60
13	NC 12	Mid-Currituck Bridge and north of Shad Street	Existing (2015)	2-Lane	C	0.29	C	0.26	C	0.30	C	0.34	C	0.36
			No-Build (2040)	2-Lane	C	0.33	C	0.30	C	0.34	C	0.39	C	0.38
			ER2 (2040)	2-Lane	C	0.33	C	0.30	C	0.34	C	0.39	C	0.38
			Build (2040)	2-Lane	C	0.33	C	0.30	C	0.34	C	0.39	C	0.38
15	MCB	US 158 and NC 12	Build (2040)	2-Lane Bridge	D	0.23	D	0.21	D	0.24	D	0.24	E	0.50

3.4 Duration of Congestion

Duration of congestion is a performance measure defined to assess how peak traffic congestion spreads out over a day. For the purposes of this study, this measure was defined to analyze the number of hours that a facility remains at LOS E or worse for the day. Table 13 shows duration of congestion for summer weekday and summer weekend for the four alternatives examined.

Table 13. Duration of Congestion for Roadway Sections

Link #	Route	Between	Alternative	Summer Weekday	Summer Weekend
1	US 158	Barco and Mid-Currituck Bridge	Existing (2015)	0	0
			No-Build (2040)	0	0
			ER2 (2040)	0	0
			Build (2040)	0	0
2	US 158	Mid-Currituck Bridge and Grandy	Existing (2015)	0	0
			No-Build (2040)	0	0
			ER2 (2040)	0	0
			Build (2040)	0	0
3	US 158	Grandy and Powells Point	Existing (2015)	0	0
			No-Build (2040)	0	0
			ER2 (2040)	0	0
			Build (2040)	0	0
4	US 158	Powells Point and Point Harbor	Existing (2015)	0	0
			No-Build (2040)	0	2
			ER2 (2040)	0	2
			Build (2040)	0	0
5	US 158	Wright Memorial Bridge	Existing (2015)	0	0
			No-Build (2040)	0	2
			ER2 (2040)	0	2
			Build (2040)	0	0

Table 13 (continued). Duration of Congestion for Roadway Sections

Link #	Route	Between	Alternative	Summer Weekday	Summer Weekend
6	US 158	Barlow Lane and Cypress Knee Trail	Existing (2015)	0	6
			No-Build (2040)	0	17
			ER2 (2040)	0	0
			Build (2040)	0	9
7	US 158	Cypress Knee Trail and NC 12	Existing (2015)	0	9
			No-Build (2040)	0	19
			ER2 (2040)	0	0
			Build (2040)	0	13
8	US 158	NC 12 and Eckner Street	Existing (2015)	0	7
			No-Build (2040)	0	16
			ER2 (2040)	0	16
			Build (2040)	0	16
9A	NC 12	US 158 and Dogwood Trail	Existing (2015)	10	12
			No-Build (2040)	15	18
			ER2 (2040)	15	18
			Build (2040)	11	12
9B	NC 12	Dogwood Trail and Sea Oats Trail / 13th Avenue	Existing (2015)	10	13
			No-Build (2040)	16	21
			ER2 (2040)	14	18
			Build (2040)	12	12
10	NC 12	Sea Oats Trail / 13th Avenue and Christopher Drive	Existing (2015)	0	10
			No-Build (2040)	13	18
			ER2 (2040)	13	18
			Build (2040)	10	7

Table 13 (concluded). Duration of Congestion for Roadway Sections

Link #	Route	Between	Alternative	Summer Weekday	Summer Weekend
11	NC 12	Christopher Drive and Audubon Drive	Existing (2015)	0	2
			No-Build (2040)	10	13
			ER2 (2040)	10	13
			Build (2040)	0	0
14	NC 12	Audubon Drive and Currituck Clubhouse Road	Existing (2015)	0	0
			No-Build (2040)	8	12
			ER2 (2040)	8	12
			Build (2040)	0	0
12B	NC 12	Currituck Clubhouse Road and Albacore Street	Existing (2015)	0	5
			No-Build (2040)	10	12
			ER2 (2040)	10	12
			Build (2040)	8	10
12A	NC 12	Albacore Street and Mid-Currituck Bridge	Existing (2015)	0	0
			No-Build (2040)	0	0
			ER2 (2040)	0	0
			Build (2040)	0	0
13	NC 12	Mid-Currituck Bridge and north of Shad Street	Existing (2015)	0	0
			No-Build (2040)	0	0
			ER2 (2040)	0	0
			Build (2040)	0	0
15	MCB	US 158 and NC 12	Build (2040)	0	12

3.5 Roadway Measures by Alternative

3.5.1 Existing Conditions

Figure 8 shows LOS and duration of congestion for summer weekday and summer weekend for 2015 Existing conditions.

3.5.2 No-Build Alternative

Figure 9 shows LOS and duration of congestion for summer weekday and summer weekend for 2040 No-Build alternative.

3.5.3 ER2

Figure 10 shows LOS and duration of congestion for summer weekday and summer weekend for 2040 ER2.

3.5.4 Mid-Currituck Bridge Preferred Alternative

Figure 11 shows LOS and duration of congestion for summer weekday and summer weekend for 2040 Preferred Alternative.

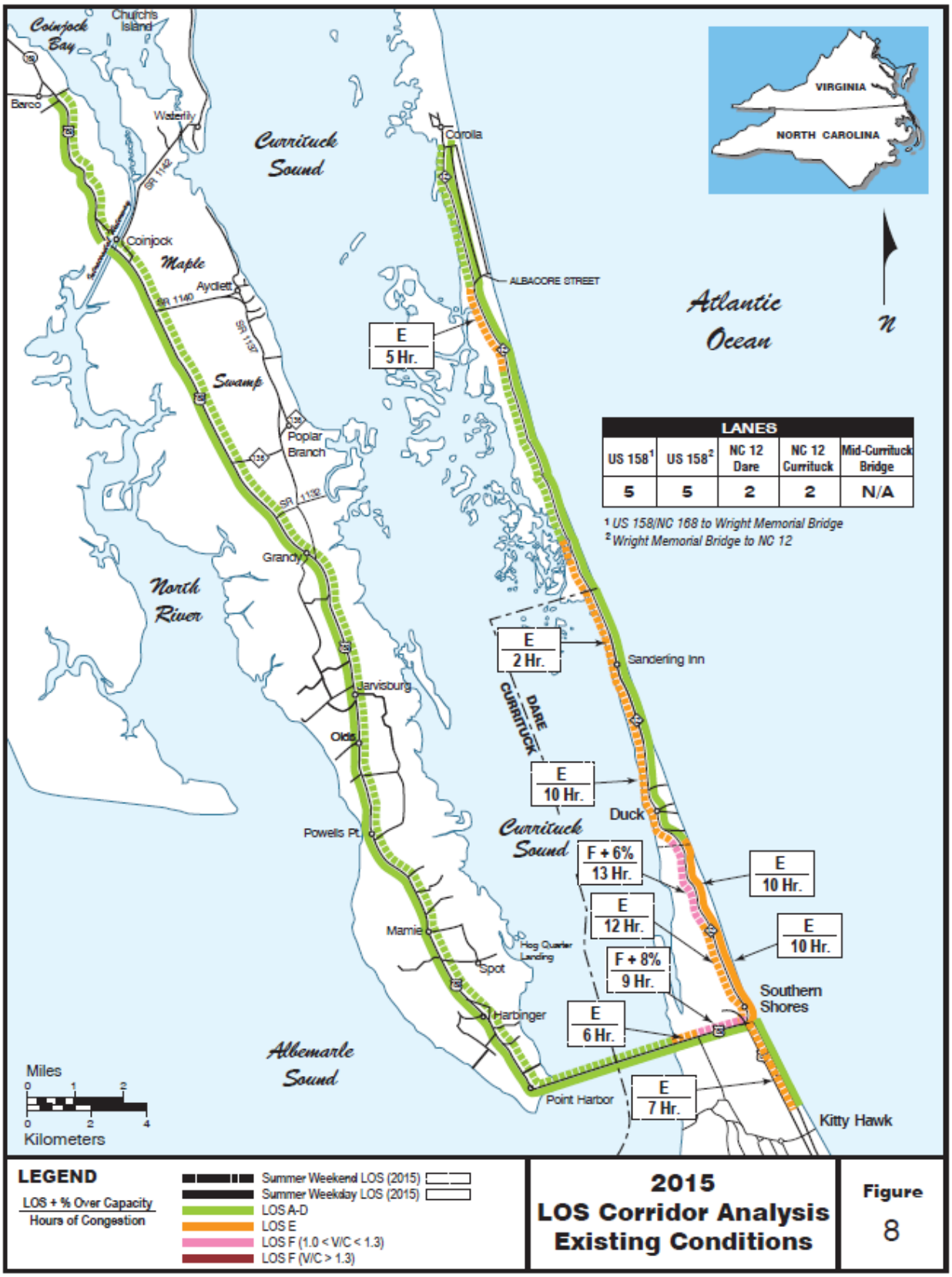

Figure 8. Existing (2015) Conditions LOS

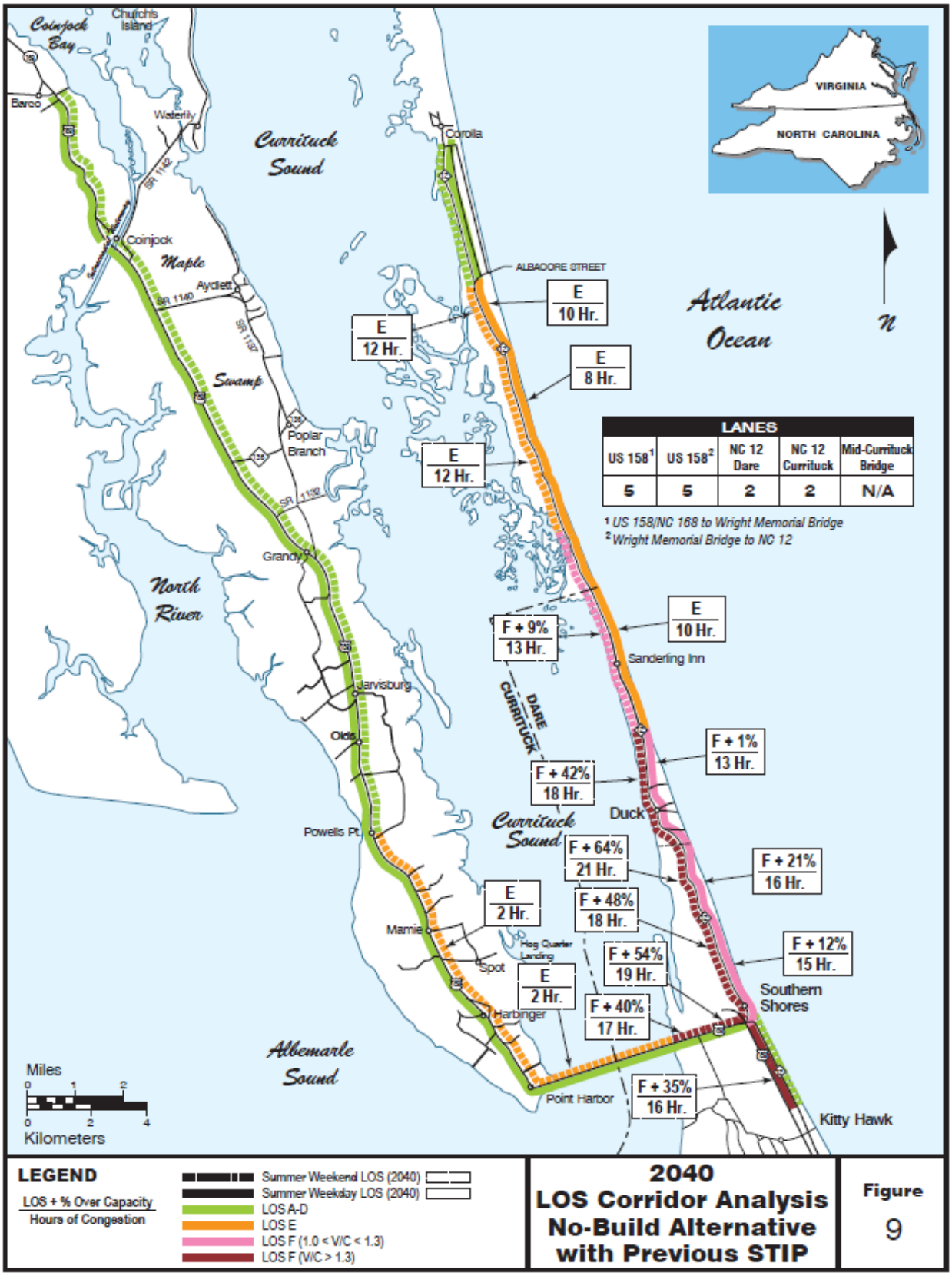

Figure 9. 2040 No-Build Alternative LOS

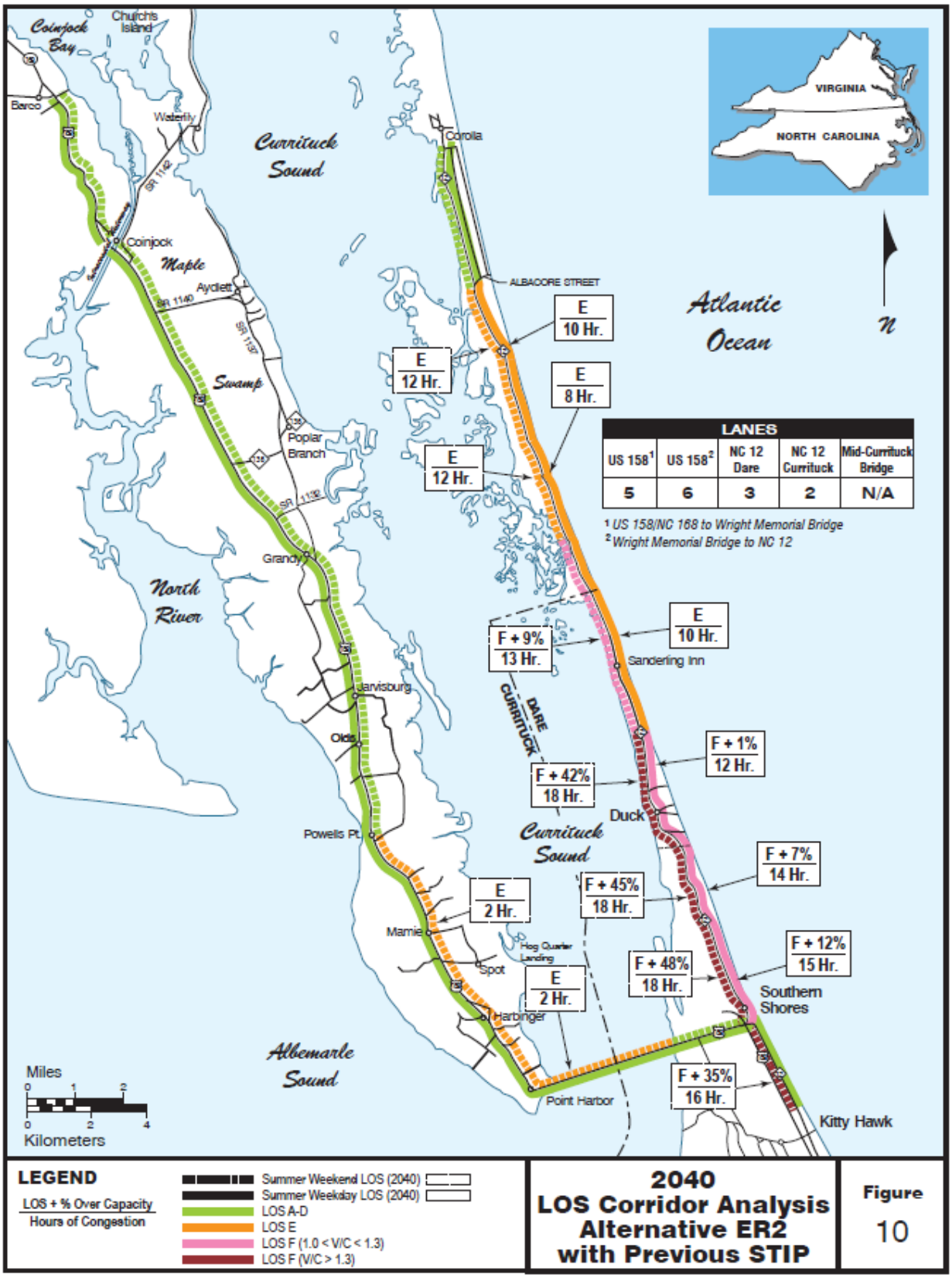

Figure 10. 2040 ER2 LOS

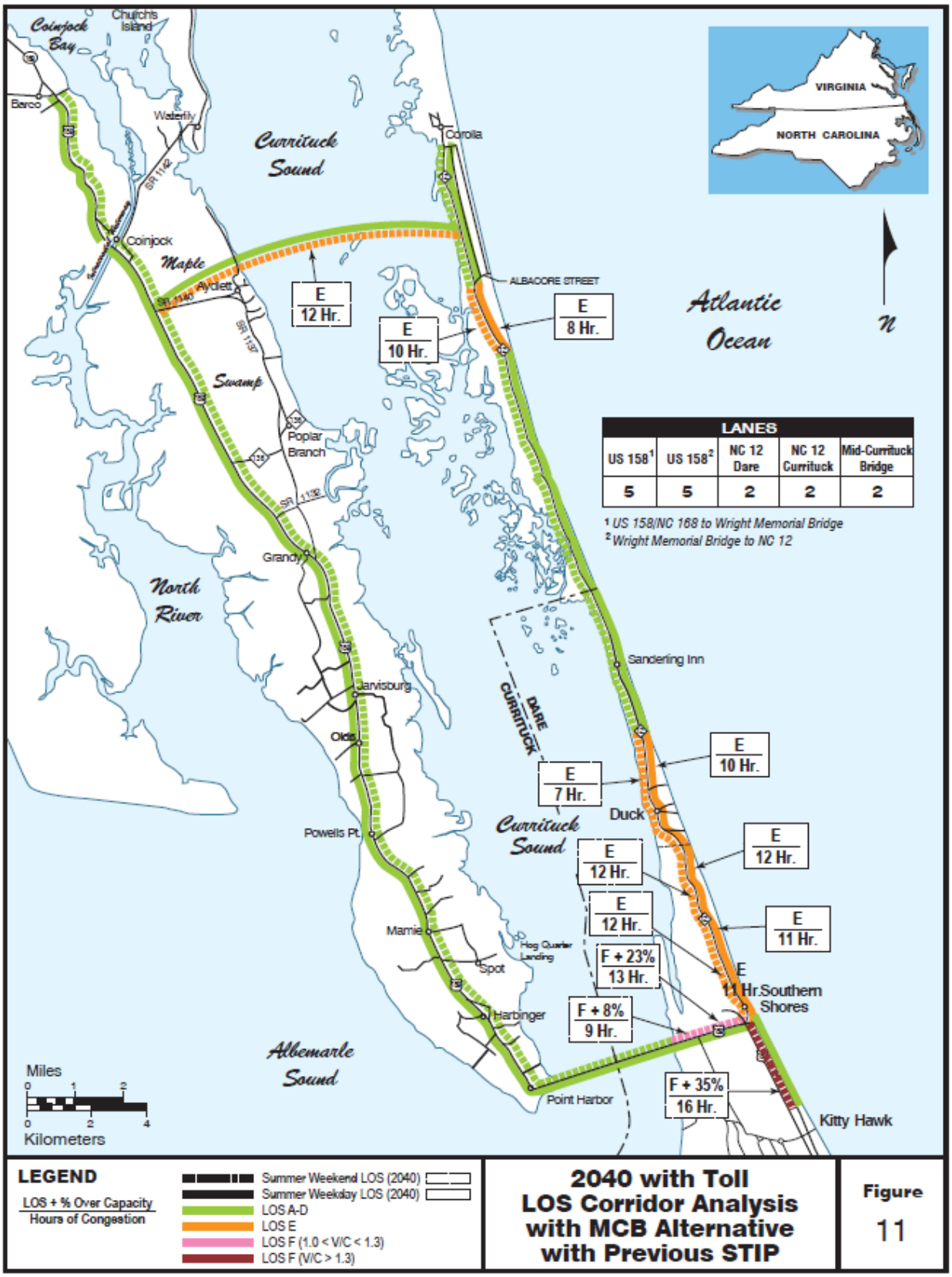

Figure 11. 2040 Preferred Alternative LOS

4.0 Network Congestion Measures

In addition to link level analysis comparing LOS and V/C ratio, network level analysis was performed comparing congestion measures for the four alternatives examined. The measures of effectiveness analyzed were *miles of congested roadway*, *congested* and *total vehicle miles traveled*, and *travel time*. The network measures are an aggregate of the 16 (+1) links analyzed in section 3.0 and follow similar assumptions.

4.1 Miles of Congested Roadway

In order to examine overall network operations, miles of congested roadway were computed for each alternative across the study area roadway network. This measure provides a calculation of the total mileage of roadway operating at LOS E, LOS F or poor LOS F. LOS F was defined as V/C ratio at or above 1.00 and poor LOS F was defined as V/C ratio at or above 1.30.

Miles of Congested Roadway are provided in Table 14 for summer weekday, summer weekend and average summer week for the four alternatives examined. The average summer week measure is computed as a simple weighted average of five summer weekdays and two summer weekends.

Table 14. Miles of Congested Roadway

Time Period	Existing (2015)	No-Build (2040)	ER2 (2040)	Preferred (2040)
Miles of Road Operating at LOS E, F, or Poor LOS F				
Summer Weekday	4.6	17.9	17.9	7.7
Summer Weekend	17.4	30.3	28.9	17.2
Weighted Average	8.3	21.4	21.0	10.4
Miles of Road Operating at LOS F or Poor LOS F				
Summer Weekday	0.0	5.8	5.8	0.0
Summer Weekend	2.8	15.5	14.1	2.5 *(1.6)*
Weighted Average	0.8	8.6	8.2	0.7 *(0.5)*
Miles of Road Operating at Poor LOS F				
Summer Weekday	0.0	0.0	0.0	0.0
Summer Weekend	0.0	8.3 *(5.8)*	6.9 *(5.8)*	1.1 *(0.0)*
Weighted Average	0.0	2.4 *(1.7)*	2.0 *(1.7)*	0.3 *(0.0)*

Notes: Total network length (excluding Mid-Currituck Bridge) is 51.4 miles.
Note: Italicized numbers reflect the addition of TIP Project R-3419

To examine overall network operations, the annual vehicle miles traveled (VMT) were computed for each alternative across the study area roadway network. Daily VMT was computed as total number of vehicles traveling on a roadway link multiplied by the length of the link. Annual VMT was calculated as a weighted average daily VMT for Non-Summer Weekdays (191), Non-Summer Weekends (76), Summer Weekdays (70) and Summer Weekends (28). The VMT is shown in units of million vehicle miles (mvm).

Table 15. Total & Congested VMT Percentages by Roadway Section

LOS E, F, poor F	Existing (2015)	No-Build (2040)	ER2 (2040)	Preferred (2040)
Total Network				
Total VMT (mvm)	330.3	502.1	502.1	416.1
Congested VMT (mvm)	16.4	98.1 *(96.8)*	94.4 *(93.7)*	37.0 *(35.6)*
Percent VMT Congested	5.0%	19.5% *(19.3%)*	18.8% *(18.7%)*	8.9% *(8.6%)*
US 158 West of Wright Memorial Bridge				
Number of Lanes	5	5	5	5
Total VMT (mvm)	199.0	293.6	293.6	233.7
Congested VMT (mvm)	0.0	3.2	3.2	0.0
Percent VMT Congested	0.0%	1.1%	1.1%	0.0%
US 158 East of Wright Memorial Bridge				
Number of Lanes	5	5 *(4)*	6	5 *(4)*
Total VMT (mvm)	27.1	36.8	36.8	33.1
Congested VMT (mvm)	1.8	4.3 *(3.1)*	2.0 *(1.3)*	3.4 *(2.0)*
Percent VMT Congested	6.7%	11.8% *(8.4%)*	5.4% *(3.5%)*	10.3% *(6.0%)*
NC 12 (Dare & Currituck)				
Number of Lanes	2/3	2/3	2/3	2/3
Total VMT (mvm)	104.2	171.7	171.7	128.8
Congested VMT (mvm)	14.6	90.5	89.2	30.8
Percent VMT Congested	14.0%	52.7%	51.9%	23.9%
New Bridge				
Number of Lanes				2
Total VMT (mvm)				20.4
Congested VMT (mvm)				2.8
Percent VMT Congested				13.6%

Note: Italicized numbers reflect the addition of TIP Project R-3419

Congested VMT for a link is computed as vehicle miles traveled if LOS on the link is E and is based on volume to capacity (V/C) ratio. Similar to Total VMT, Congested VMT is also calculated for across the study area network as a weighted average and shown in units of million vehicle miles. Percent VMT Congested is calculated as a ratio of Congested VMT to Total VMT. Table 15 provides Total VMT, Congested VMT and Percent VMT Congested for the entire network and by roadway section.

Table 16 also provides total and congested VMT for three different congestion levels:

- LOS E or worse (LOS E, LOS F and poor LOS F). Defined based on volume to capacity (V/C) ratio.
- LOS F or worse (LOS F and poor LOS F). Defined as demand to capacity (D/C) ratio at or above 1.00.
- Poor LOS F. Defined as demand to capacity (D/C) ratio at or above 1.30.

4.2 Travel Time

Travel time is a function of distance, vehicle speed, and traffic signal delays. The following analysis presents travel time for years 2015 and 2040 for the four alternatives examined. The travel time analysis was developed for Summer Weekday and Summer Weekend conditions.

A spreadsheet method with inputs from Synchro analysis was utilized to computes travel times. Traffic model was developed in Synchro based on NCDOT congestion management analysis guidelines. Peak hour traffic volumes were computed using detailed forecasts (intersection level daily forecasts for summer weekday and summer weekend) and NCDOT's Intersection Analysis Utility (IAU). The spreadsheet method computes running time based on length and free-flow speed. It utilizes control delay for the movement from Synchro model and queue delay for the movement based on V/C ratio. Travel time was then computed as a sum of running time, control delay and queue delay.

The travel time was computed for the inbound direction, traveling southbound on US 158 near proposed mid-Currituck bridge through Wright Memorial Bridge to other side of proposed bridge on NC 12. The inbound direction is the critical direction congestion-wise as it has higher travel delays. For summer weekday, AM peak is critical in inbound direction while for summer weekend PM is critical in the inbound direction.

Table 16. Total and Congested VMT for Multiple Congestion Level

Vehicle Miles Traveled (VMT)	Existing (2015)	No-Build (2040)	ER2 (2040)	Preferred (2040)
Total Network				
Total	330.3	502.1	502.1	416.1
LOS E, LOS F and Poor F	16.4 (5.0%)	98.1 (19.5%) *96.8 (19.3%)*	94.4 (18.8%) *93.7 (18.7%)*	37.0 (8.9%) *5.6 (8.6%)*
LOS F and Poor F	0.7 (0.2%)	24.1 (4.8%) *23.1 (4.6%)*	17.8 (3.6%) *17.3 (3.4%)*	2.6 (0.6%) *1.1 (0.3%)*
Poor F	0 (0%)	4.1 (0.8%) *2.4 (0.5%)*	2.4 (0.5%) *2.1 (0.4%)*	0.3 (0.1%) *0.0 (0.0%)*
US 158 West of Wright Memorial Bridge				
Total	199.0	293.6	293.6	233.7
LOS E, LOS F and Poor F	0 (0%)	3.2 (1.1%)	3.2 (1.1%)	0 (0%)
LOS F and Poor F	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Poor F	0 (0%)	0 (0%)	0 (0%)	0 (0%)
US 158 East of Wright Memorial Bridge				
Total	27.1	36.8	36.8	33.1
LOS E, LOS F and Poor F	1.8 (6.7%)	4.3 (11.8%) *3.1 (8.4%)*	2.0 (5.4%) *1.3 (3.5%)*	3.4 (10.3%) *2.0 (6.0%)*
LOS F and Poor F	0.3 (1.2%)	3.6 (9.8%) *2.7 (7.2%)*	1.5 (4.1%) *1.0 (2.6%)*	2.6 (7.7%) *1.1 (3.3%)*
Poor F	0 (0%)	1.6 (4.5%) *0.0 (0.0%)*	0.3 (0.9%) *0.0 (0.0%)*	0.3 (1.0%) *0.0 (0.0%)*
NC 12 (Dare & Currituck)				
Total	104.2	171.7	171.7	128.8
LOS E, LOS F and Poor F	14.6 (0.4%)	90.5 (52.7%)	89.2 (51.9%)	30.8 (23.9%)
LOS F and Poor F	0.4 (0.4%)	20.5 (11.9%)	16.3 (9.5%)	0 (0%)
Poor F	0 (0%)	2.4 (1.4%)	2.1 (1.2%)	0 (0%)
New Bridge				
Total				20.4
LOS E, LOS F and Poor F				2.8 (13.6%)
LOS F and Poor F				0 (0%)
Poor F				0 (0%)

Note: Italicized numbers reflect the addition of TIP Project R-3419

In addition to the total analysis network - from one end of the proposed bridge to the other - which is approximately 43 miles long, travel time and average speeds are also shown for four segments:

- US 158 southbound – from proposed the Mid-Currituck Bridge interchange to the Wright Memorial Bridge
- US 158 southbound – from the Wright Memorial Bridge to NC 12
- NC 12 northbound – from US 158 to Currituck-Dare County line
- NC 12 northbound – from Currituck-Dare county line to the Mid-Currituck Bridge roundabout

Travel time data was also collected in the field using GPS. Multiple travel time runs were collected for summer weekdays and summer weekends. An average was calculated after removing the outliers.

Table 17 shows travel time and average speed for summer weekday AM peak in inbound direction. Table 18 shows travel time and average speed for summer weekend PM peak in inbound direction.

The average travel time for summer weekday collected in the field compares well with the 2015 summer weekday modeled travel time. Existing 2015 summer weekday conditions experienced little delay and were representative of uncongested travel times. The similarity of the uncongested travel time with field data serves a validation of the model. Field travel times for 2015 summer weekend showed high delay and congestion. Summer weekend travel time from 2015 model are lower than field data as the field data was skewed because of high travel time from some runs especially on NC 12 in the Southern Shores and Duck area.

Table 17. Travel Time and Speed for Summer Weekday (Inbound only; AM peak)

Summer Weekday		Observed (2015)	Existing (2015)	No-Build (2040)	ER2 (2040)	Build (2040)
Inbound Segment	**Distance (mi)**	**Travel Time (minutes)**				
US 158 SB - Aydlett Road to WMB	22.7	23.6	23.6	23.7	23.7	23.7
US 158 SB - WMB to NC 12	1.6	2.9	3.7	9.2	3.4	6.4
NC 12 NB - US 158 to County Line	10.1	19.3	19.3	63.4	55.2	27.2
NC 12 NB - County Line to Albacore Street	7.1	11.0	10.0	19.6	19.6	11.3
Total	**41.6**	**56.8**	**56.7**	**115.9**	**101.9**	**68.6**
Inbound Segment	**Distance (mi)**	**Average Travel Speed (mph)**				
US 158 SB - Aydlett Road to WMB	22.7	57.8	57.7	57.5	57.6	57.5
US 158 SB - WMB to NC 12	1.6	33.0	25.8	10.4	27.9	15.0
NC 12 NB - US 158 to County Line	10.1	31.4	31.4	9.6	11.0	22.3
NC 12 NB - County Line to Albacore Street	7.1	38.8	42.6	21.8	21.8	37.7
Total	**41.6**	**43.9**	**44.0**	**21.5**	**24.5**	**36.4**

Table 18. Travel Time and Speed for Summer Weekend (Inbound only; PM peak)

Summer Weekend		Observed (2015)	Existing (2015)	No-Build (2040)	ER2 (2040)	Build (2040)
Inbound Segment	**Distance (mi)**	**Travel Time (minutes)**				
US 158 SB - Aydlett Road to WMB	22.7	49.8	24.0	45.9	45.9	26.4
US 158 SB - WMB to NC 12	1.6	13.7	12.7	30.7	8.3	21.4
NC 12 NB - US 158 to County Line	10.1	65.9	31.4	83.6	74.7	23.2
NC 12 NB - County Line to Albacore Street	7.1	11.1	10.5	26.4	26.4	10.9
Total	**41.6**	**140.5**	**78.6**	**186.7**	**155.3**	**81.9**
Inbound Segment	**Distance (mi)**	**Average Travel Speed (mph)**				
US 158 SB - Aydlett Road to WMB	22.7	27.4	56.9	29.7	29.7	51.7
US 158 SB - WMB to NC 12	1.6	7.0	7.5	3.1	11.6	4.5
NC 12 NB - US 158 to County Line	10.1	9.2	19.3	7.3	8.1	26.2
NC 12 NB - County Line to Albacore Street	7.1	38.5	40.5	16.1	16.1	38.9
Total	**41.6**	**17.7**	**31.7**	**13.4**	**16.1**	**30.4**

5.0 Conclusions

The purpose of this report is to provide traffic measures of effectiveness to facilitate comparison of alternatives for the FEIS re-evaluation. The alternatives being compared include 2015 Existing, 2040 No-Build, 2040 ER2 and 2040 Preferred Alternative. A similar analysis was done for the original FEIS which evaluated alternatives for 2035 conditions.

5.1 Traffic Forecasts

This analysis utilizes the updated Traffic Forecasts completed on June 2016. The updated traffic forecasts have 2040 as the horizon year instead of 2035 as the horizon year as in previous (2009) forecasts and original FEIS. In general, the revised 2040 forecasts are lower than the previous 2035 forecasts, reflecting a slowdown in the growth rate since the development of previous forecast.

Details about traffic forecast are provided in Chapter 2.0.

5.2 Capacity and Level of Service

Detailed analysis with link level volume to capacity (v/c) ratio and level of service (LOS) is provided in Chapter 4.0. A summary of findings is provided below.

5.2.1 US 158 West of Wright Memorial Bridge

Links 1, 2, 3 and 4 represent US 158 west of the Wright Memorial Bridge and link 5 represents the Wright Memorial Bridge.

For 2040 Summer Weekday conditions, all alternatives are projected to operate at LOS C or better for links 1 through 5.

For 2040 Summer Weekend conditions, all alternatives are projected to operate at LOS D or better for links 1 through 3. On links 4 and 5, 2040 No-Build and 2040 ER2 alternatives would operate at LOS E while 2040 Preferred Alternative would operate at LOS C due to diverted traffic to the Mid-Currituck Bridge.

5.2.2 US 158 east of Wright Memorial Bridge

Links 6 and 7 represent US 158 between the Wright Memorial Bridge and NC 12, and link 8 represents US 158 south/ east of NC 12.

For 2040 Summer Weekday conditions, all alternatives are projected to operate at LOS D or better.

For 2040 Summer Weekend conditions, the No-Build Alternative is expected to experience LOS F with sever level of congestion. With ER2, links 6 and 7 get additional capacity and operate at LOS D. With the Preferred alternative, links 6 and 7 operate at LOS F.

5.2.3 NC 12 in Dare County

Links 9A, 9B, 10 and 11 represent NC 12 in Dare County.

For 2040 Summer Weekday conditions, No-Build and ER2 alternatives show LOS E and F with some moderate level of congestion. With the Preferred Alternative, the LOS is D and E.

For 2040 Summer Weekend conditions, No-Build and ER2 alternatives show LOS F and high v/c with severe level of congestion. ER2 slightly improves capacity with the third center lane (part of the section) but still shows high level of congestion. With the Preferred Alternative, the projected LOS is E due to reduced traffic which gets diverted through the Mid-Currituck Bridge.

5.2.4 NC 12 in Currituck County

Links 14, 12B, 12A and 13 represent NC 12 in Currituck County.

For both 2040 Summer Weekday and Summer Weekend conditions this section is projected to operate similar in all the three alternatives with LOS D and E.

5.3 Network Measures of Effectiveness

Congestion is defined here as LOS E or worse.

For 2040 Summer Weekday, No-Build and ER2 alternatives are expected to have 17.9 miles of roadway with congested conditions while the Build alternative is expected to have 7.7 miles of congested roadway. For 2040 Summer Weekend, No-Build, ER2 and the Preferred Alternative are expected to have 30.3, 28.9 and 17.2 miles of congested roadway respectively.

5.4 Travel Time

Travel times were developed for each segment in the study area. The 2040 No-Build Alternative analysis shows a major increase in travel time from the 2015 existing analysis. The area where travel time increases the most is along NC 12 from US 158 to the Dare/Currituck County line. During the peak weekday for the 2040 No-Build Alternative, the total travel time from the west terminus of the proposed bridge at US 158 to the east terminus of the bridge at NC 12, along existing routes, is 116 minutes. With ER2, that drops to 102 minutes. With the Preferred Alternative, that drops even more to 69 minutes. During the weekend peak, the travel times increase. For the 2040

No-Build Alternative, the travel time is 187 minutes. ER2 travel time is 155 minutes, while the Preferred Alternative is 82 minutes. The travel time analyses shows a major decrease in travel time with the Mid-Currituck Bridge in place along the exiting corridors.